

GEAR REDUCTION DRIVES, HORIZONTAL CONNECTING SHAFTS, AND ASSOCIATED BEARINGS AND BRACKETS PIECE-PART DATA AND REPLACEMENT PROCEDURES

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of gear reduction drives, horizontal connecting shafts, and associated bearings and brackets (6, 7, 8, 28, 30, 31, 32, 33, 34 and 1034 type drives; 2, 3, 6 and 10 type shafts; 5, 6, 8, 9 and 12 type bearings and 3, 6, 9, 11 and 12 type brackets).

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03 Part 2 of this section covers the piece part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of gear reduction drives, horizontal connecting shafts, and associated bearings and brackets. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called "Piece Part Data".

1.04 Part 3 of this section covers the approved procedures for the replacement of the parts covered under Part 2. This information is called "Replacement Procedures."

2. PIECE PART DATA

2.01 The figures included in this part show the various piece parts in their prop-

er relation to other parts of the apparatus. The piece part numbers of the various parts are given together with the names of the parts as listed by the Western Electric Company Merchandise Department.

2.02 When ordering parts for replacement purposes, give the piece part number as well as the name of the part. Example: "P-154233 Gear Case". Do not refer to the BSP number or to any information shown in parenthesis following the piece part numbers.

2.02.1 Wherever Bristle setscrews are specified in this section and replacements are required, hexagon socket setscrews of corresponding size and type of point shall be ordered.

2.03 When ordering a No. 6A shaft order a No. 6A shaft per A-124380 and specify the length required and the distance between one end of the shaft and the center of the nearest flat on the shaft and the distance between the centers of one flat to the next flat. Example: No. 6A shaft per A-124380, 8'-0" long, length to first bearing flat 3'-0", length between flats 2'-0".

2.04 The piece part data for the couplings which connect a drive to a vertical drive shaft are given in the Division 159 section covering vertical drive shafts and associated apparatus.

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2.05 The piece part data for coded gear reduction drives, horizontal connecting shafts and associated bearings are given on the figures indicated in the following table.

Apparatus	External Parts	Internal Parts	Interrupter Assembly	Alarm Mechanism	Misc. Parts
Drives					
6A	Fig. 1	Fig. 6	-	Fig. 7	Fig. 9, 10, 11, 12
6B	2	6	Fig. 13	7	9, 10, 11, 12
6C	1	6	-	7	9, 10, 11, 12
6D	2	6	13	7	9, 10, 11, 12
6E	5	6	-	8	9, 10, 11, 12
6F	4	6	13	-	9, 10, 11, 12
6G	4	6	13	-	9, 10, 11, 12
7A	3	6	-	-	9, 10, 11, 12
7B	3	6	-	-	9, 10, 11, 12
7C	3	6	-	-	9, 10, 11, 12
7D	4	6	13	-	9, 10, 11, 12
7E	3	6	-	-	9, 10, 11, 12
7G	4	6	13	-	9, 10, 11, 12
8A	1	6	-	7	9, 10, 11, 12
8B	1	6	-	7	9, 10, 11, 12
8C	1	6	-	7	9, 10, 11, 12
8D	1	6	-	7	9, 10, 11, 12
8E	5	6	-	8	9, 10, 11, 12
8F	5	6	-	8	9, 10, 11, 12
8G	5	6	-	8	9, 10, 11, 12
28A	14	14	-	-	11
28B	14	14	-	-	11
30A	15, 17	17	-	7	9, 10, 11, 12, 16
31A	18	18	-	-	11
32A	19	19	-	-	11
32B	19	19	-	-	11
32C	19	19	-	-	11
33A	20	20	-	-	11
33B	20	20	-	-	11
33C	20	20	-	-	11
34A	21	21	-	8	10, 11, 12, 22, 23
34B	21	21	-	8	10, 11, 12, 23, 24
1034A	21	21	-	8	10, 11, 12, 22, 23
1034B	21	21	-	8	10, 11, 12, 23, 24
Shafts					
2 Type	-	-	-	-	25, 26
3A	-	-	-	-	27
6 Type	-	-	-	-	28
10A	-	-	-	-	29
Bearings					
5A	32	33	-	-	30
5B	32	34	-	-	30
5C	31	34	-	-	30
6A	32	33	-	-	30
6B	32	34	-	-	30
8A	32	33	-	-	30
8B	32	34	-	-	30
9A	31	34	-	-	30
12A	31	34	-	-	30
Brackets					
3A	-	-	-	-	35
6 Type	-	-	-	-	37
7 Type	-	-	-	-	35
9A	-	-	-	-	35
11A	-	-	-	-	36
12A	-	-	-	-	38

2.06 The following D-specification drives are the same as the coded drives unless there is a difference in parts in the table on page 22.

<u>D-Spec. Drive</u>	<u>Coded Drive</u>
D-16792	8A
D-18624	7A
D-18625	8A
D-18626	28A
D-76897	7E
D-76898	7E
D-76925	6E
D-77341	7C
D-77342	7C
D-78671	7E
D-78805	8F
D-78903	7C
D-78904	7E
D-78905	8F
D-80080	7E
D-80920	6G

<u>D-Spec. Drive</u>	<u>Coded Drive</u>
D-90210	1034A
D-90211	1034B
D-90217	33A
D-90218	33B
D-90242	34A
D-90243	34B

2.07 The following D-specification drives are the same as the coded drives indicated except that originally rigid couplings were furnished instead of eccentric couplings.

<u>D-Spec. Drive</u>	<u>Coded Drive</u>
D-43371	6D
D-43395	7B
D-43396	7D
D-43397	8D
D-43556	6C
D-43721	8C

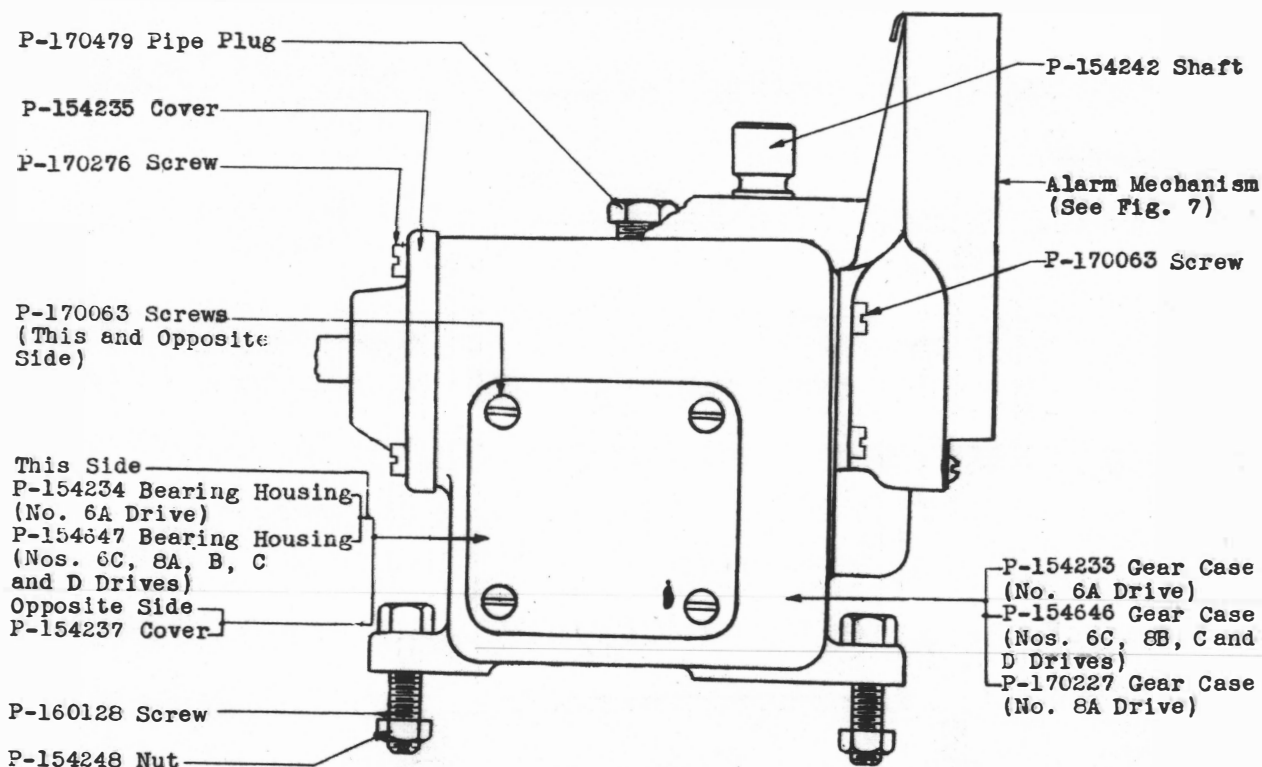


Fig. 1 - External Parts of Gear Case
(Nos. 6A, C, 8A, B, C and D Drives)

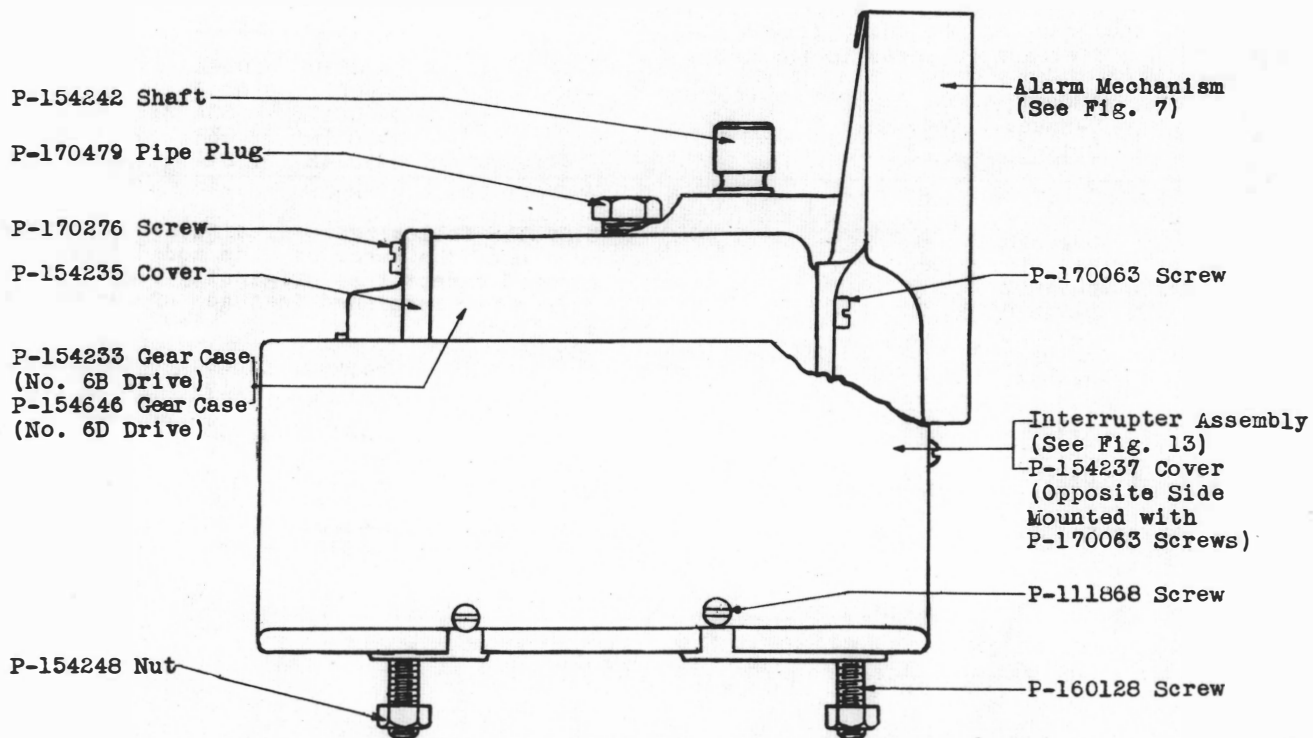


Fig. 2 - External Parts of Gear Case
(Nos. 6B and D Drives)

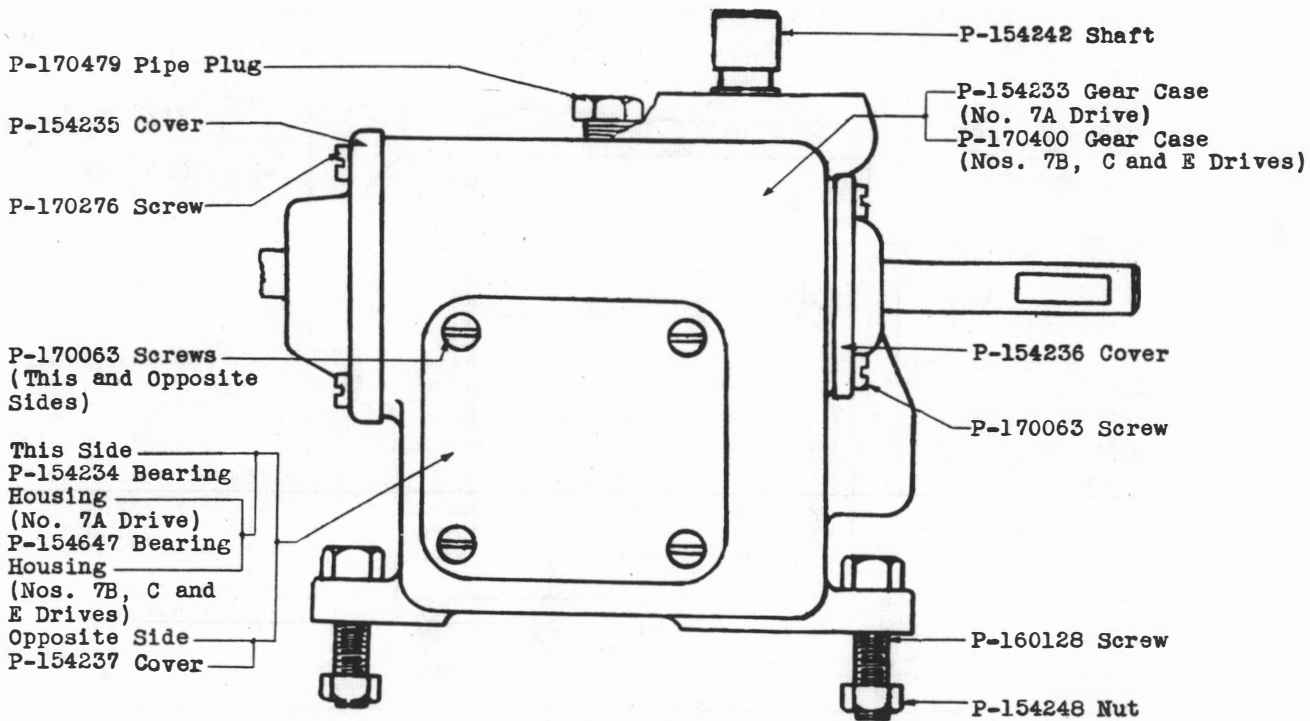


Fig. 3 - External Parts of Gear Case
(Nos. 7A, B, C and E Drives)

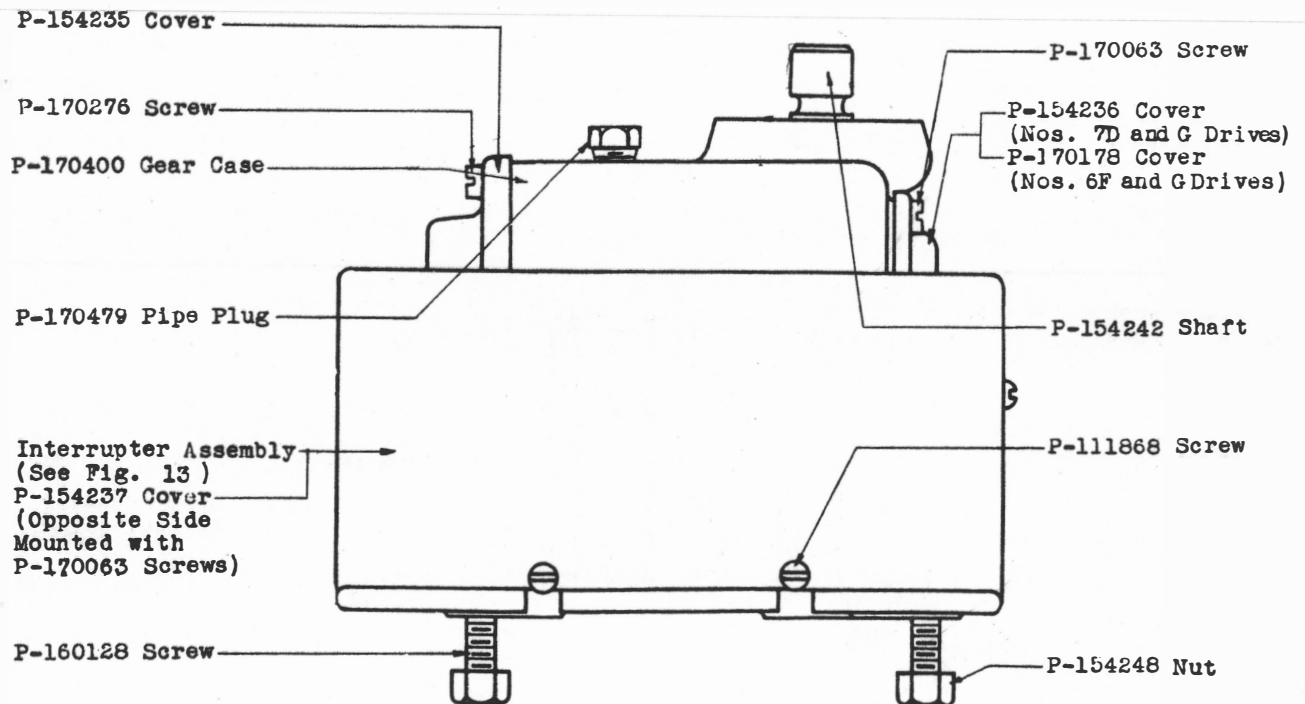


Fig. 4 - External Parts of Gear Case
(Nos. 6F, G, 7D and G Drives)

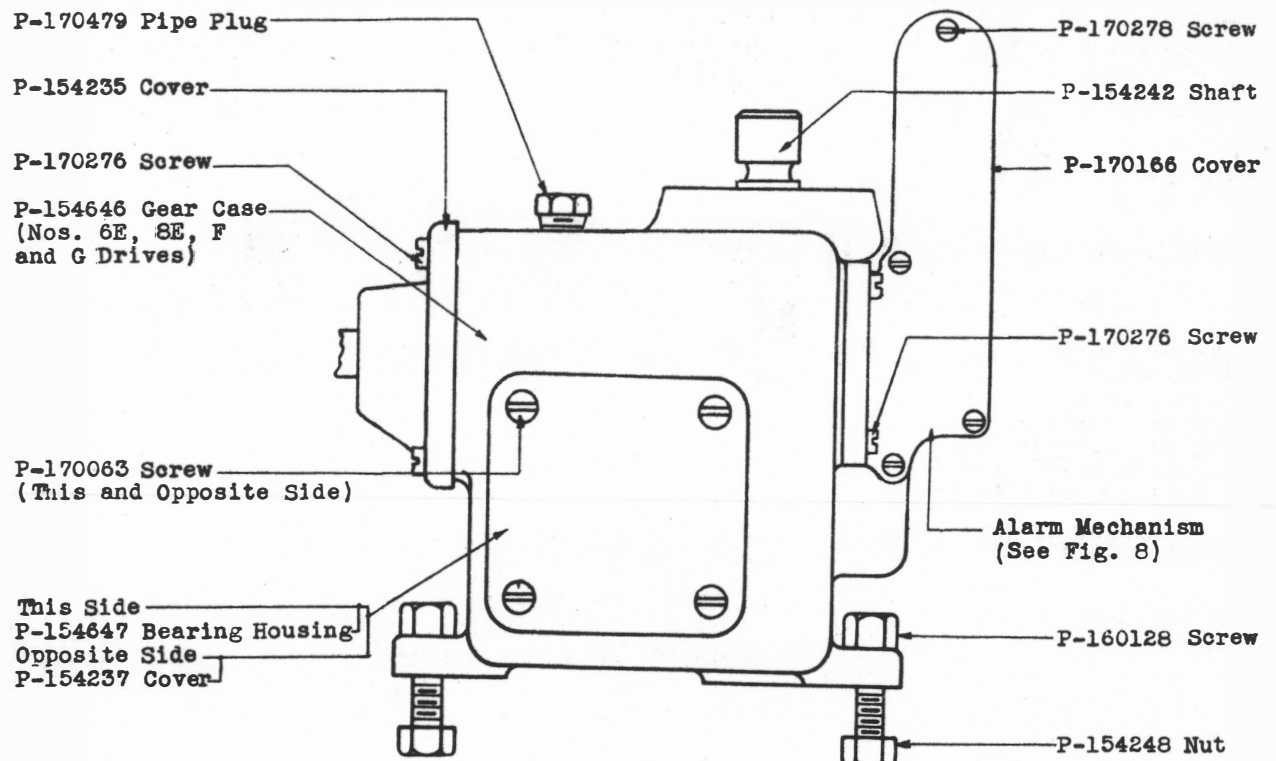


Fig. 5 - External Parts of Gear Case
(Nos. 6E, 8E, F and G Drives)

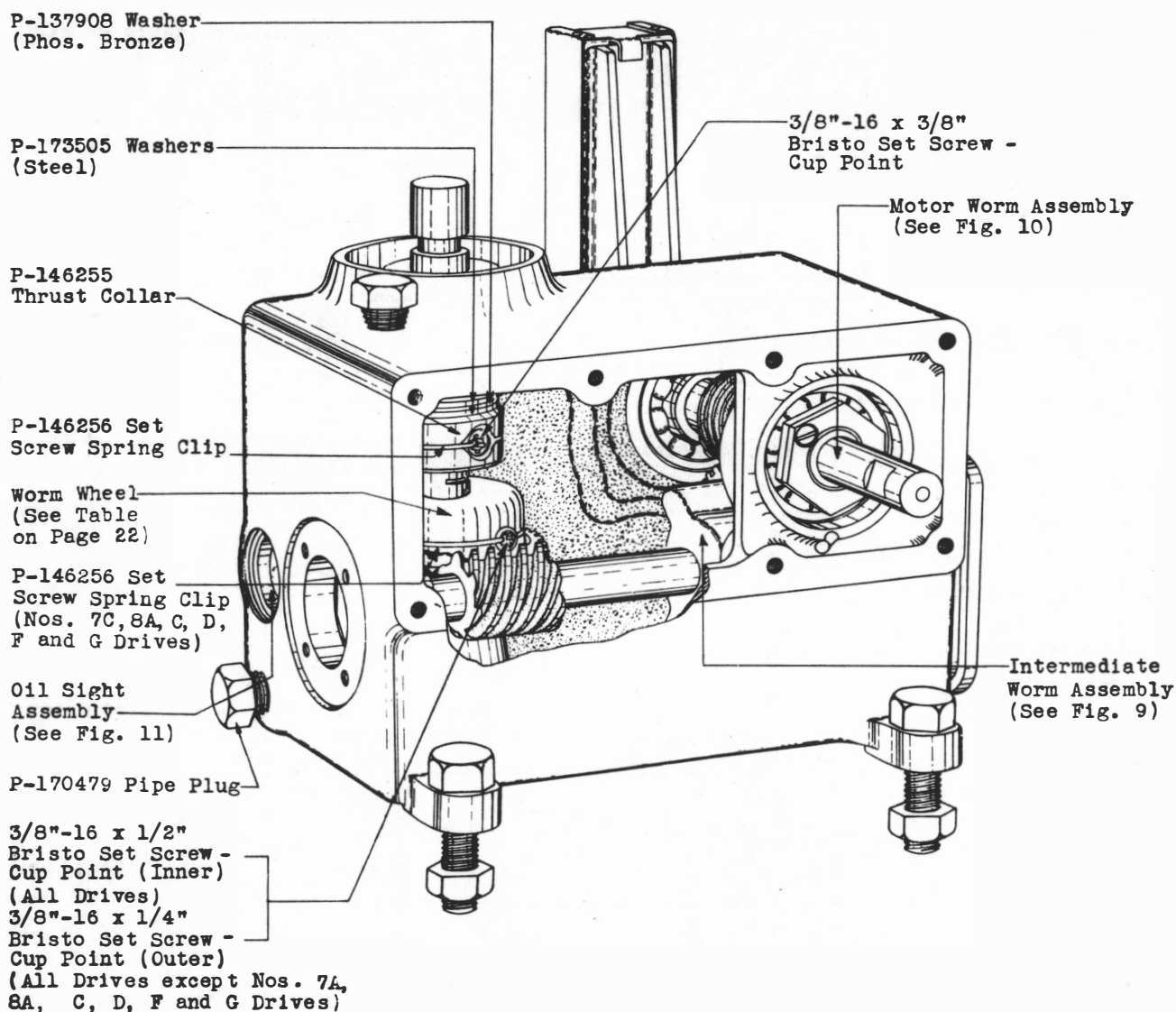


Fig. 6 - Internal Parts of Gear Case
(6, 7 and 8 Type Drives)

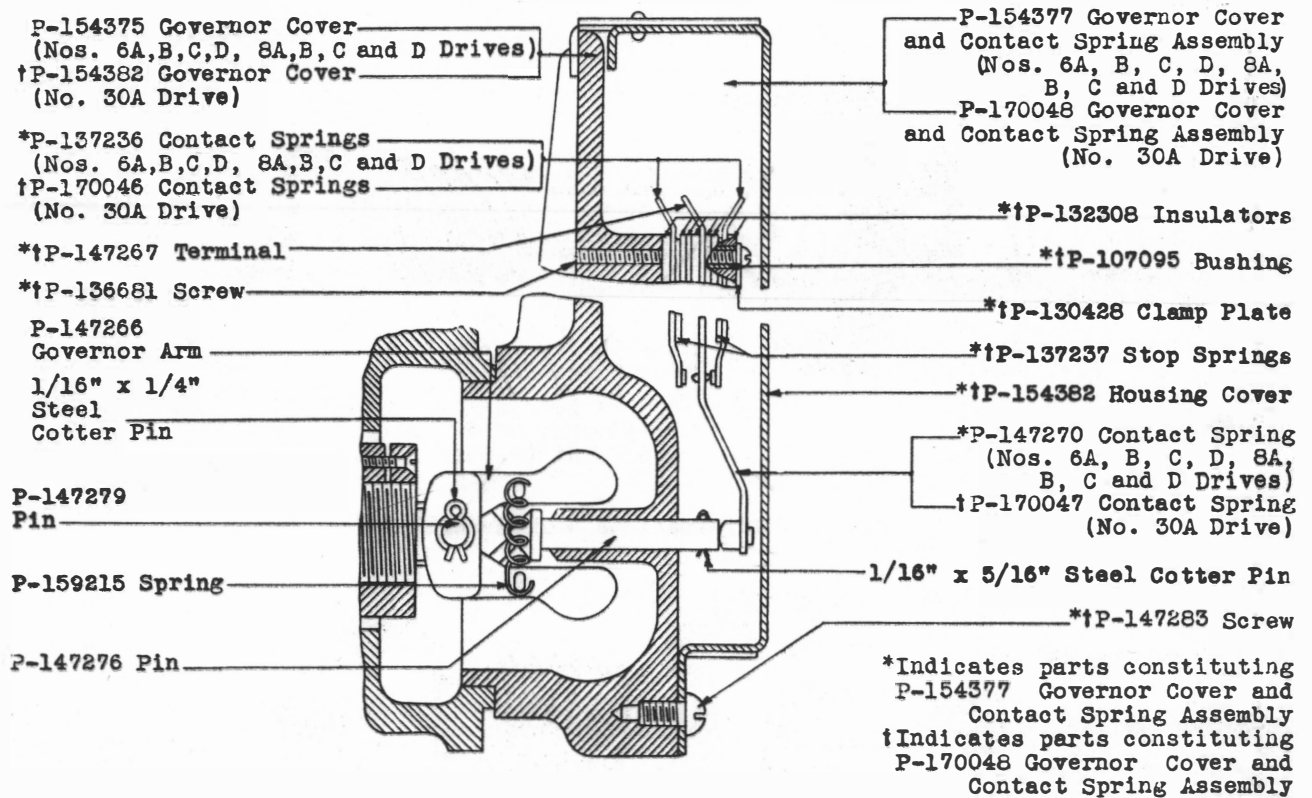


Fig. 7 - Cast Weight Alarm Mechanism
(Nos. 6A,B,C,D, 8A,B,C,D and 30A Drives)

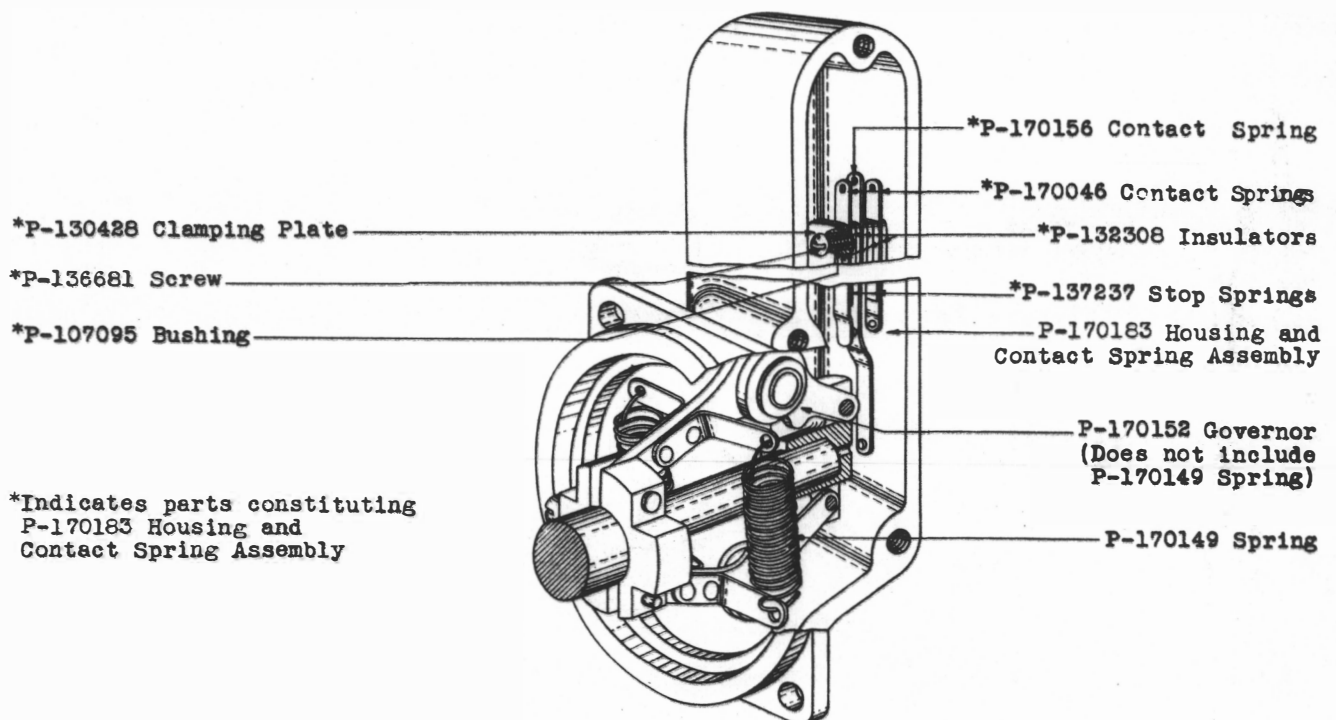


Fig. 8 - Link Type Alarm Mechanism
(Nos. 6E, 8E, F, G, 34A, B, 1034A and B Drives)

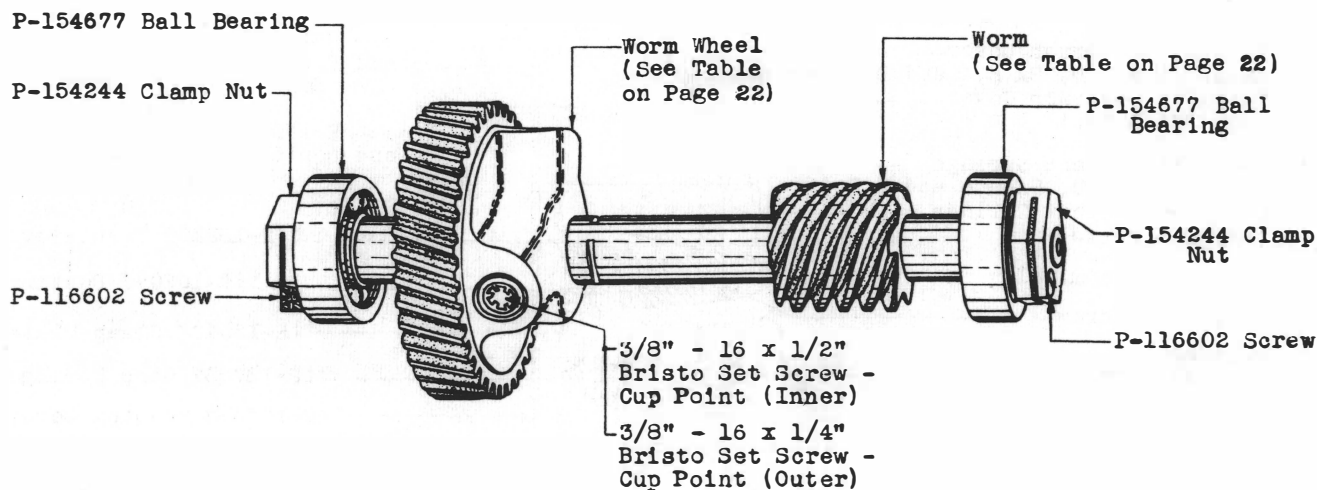


Fig. 9 - Intermediate Worm Assembly

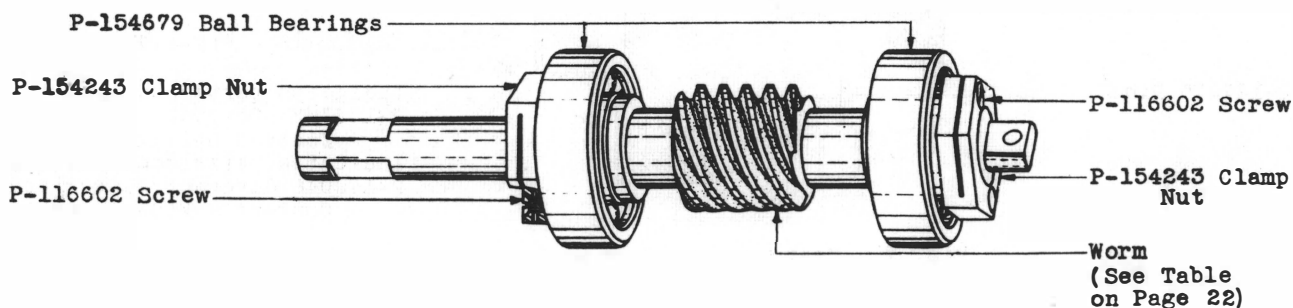


Fig. 10 - Motor Worm Assembly

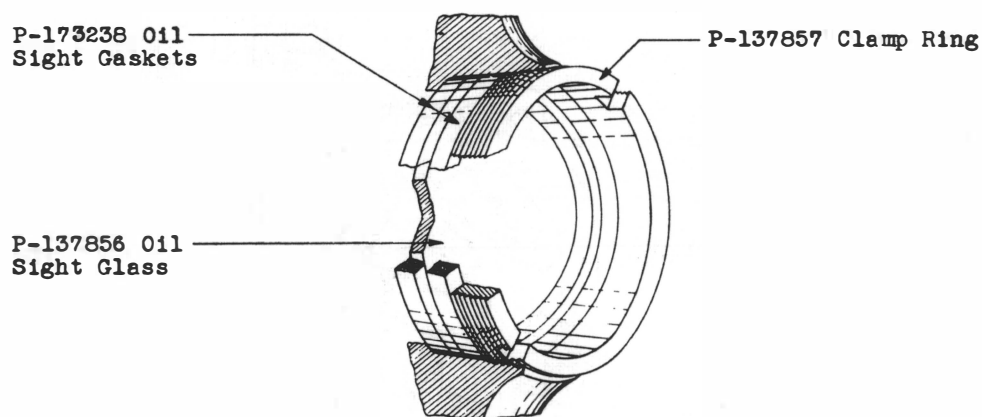


Fig. 11 - Oil Sight Assembly (All Drives)

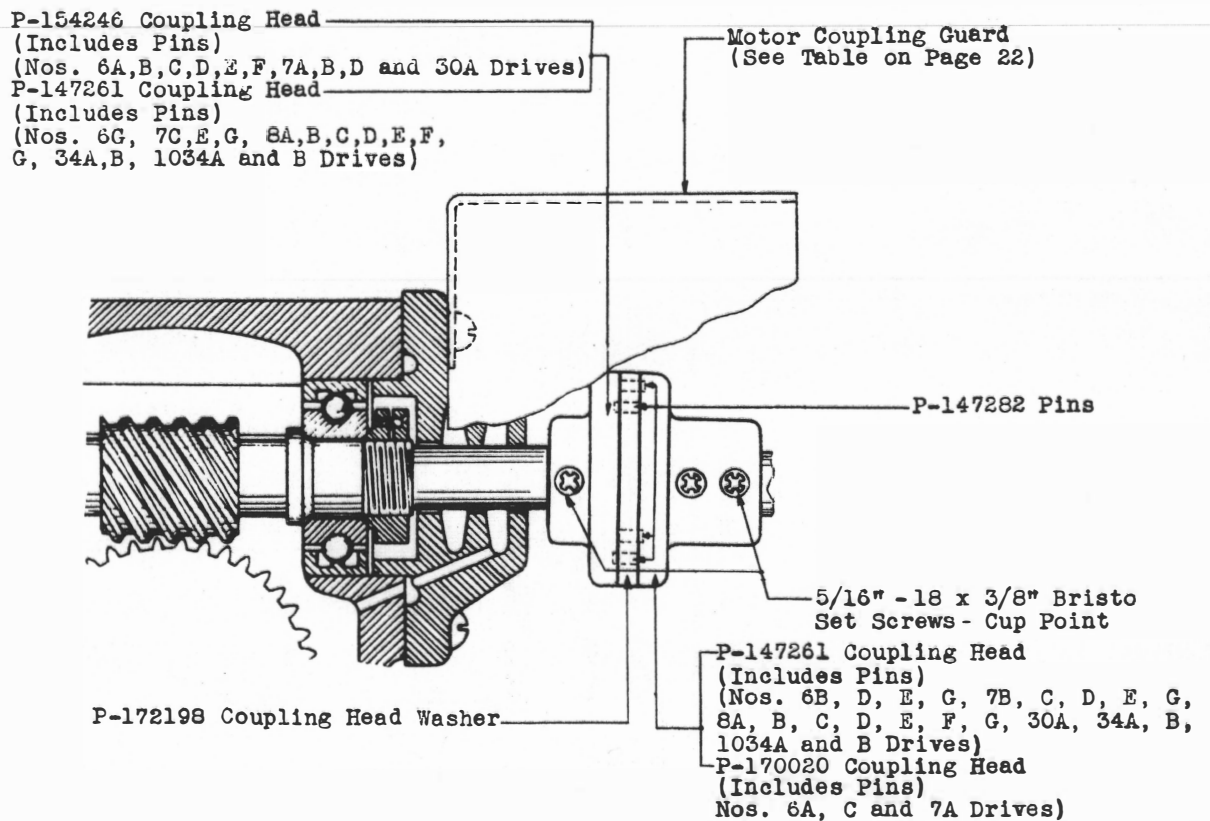
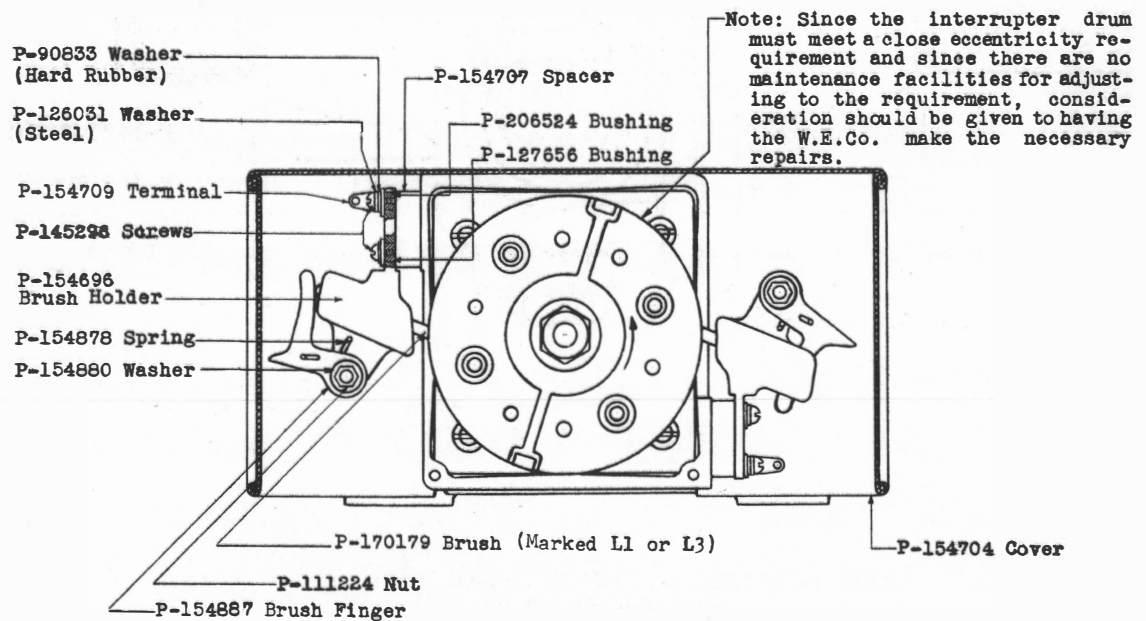


Fig. 12 - Drive Coupling Assembly and Coupling Guard

Fig. 13 - Interrupter Assembly
(Nos. 6B,D,F,G, 7D, G Drives)

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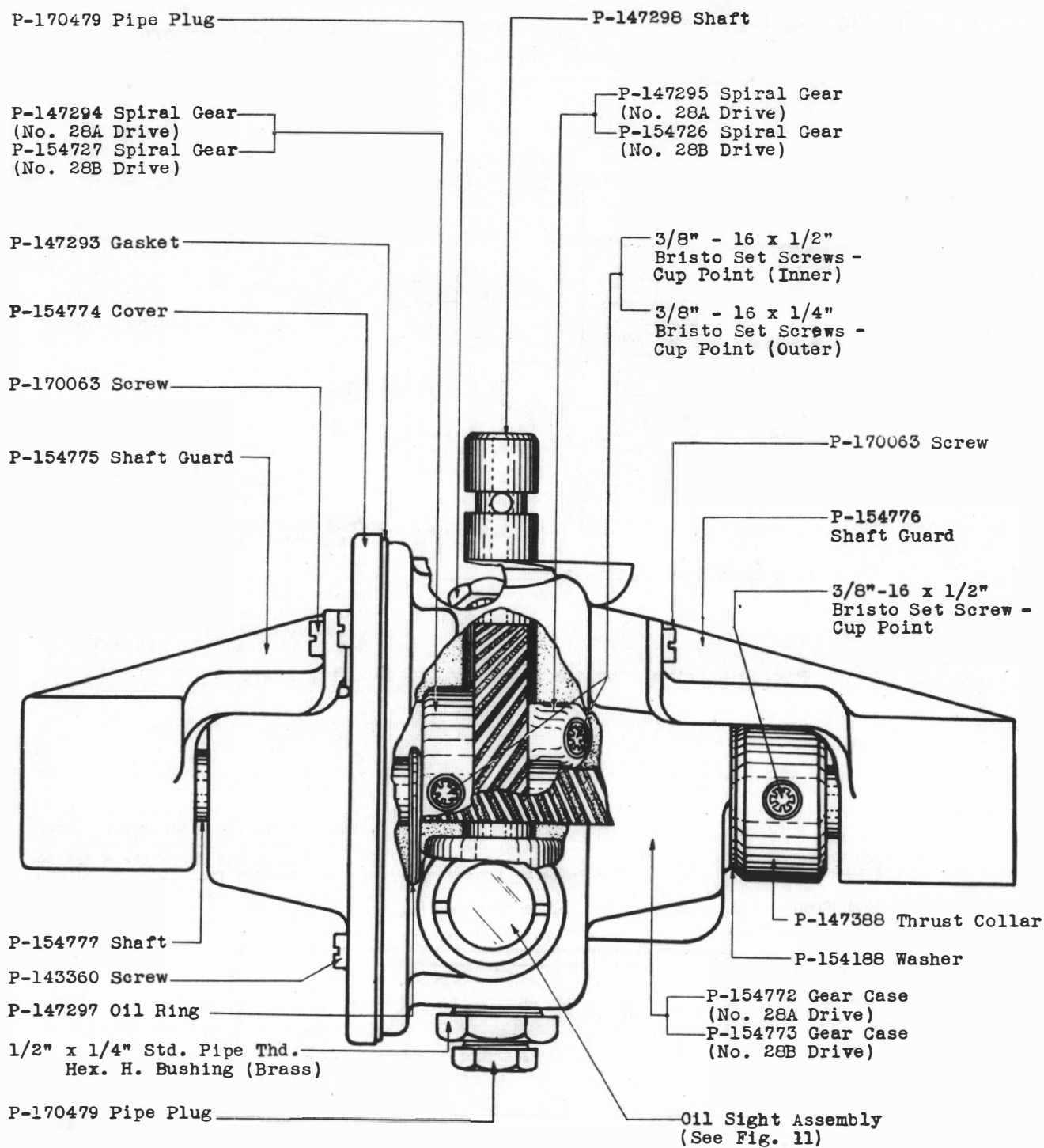


Fig. 14 - Internal and External Parts of Gear Case
(Nos. 28A and B Drives)

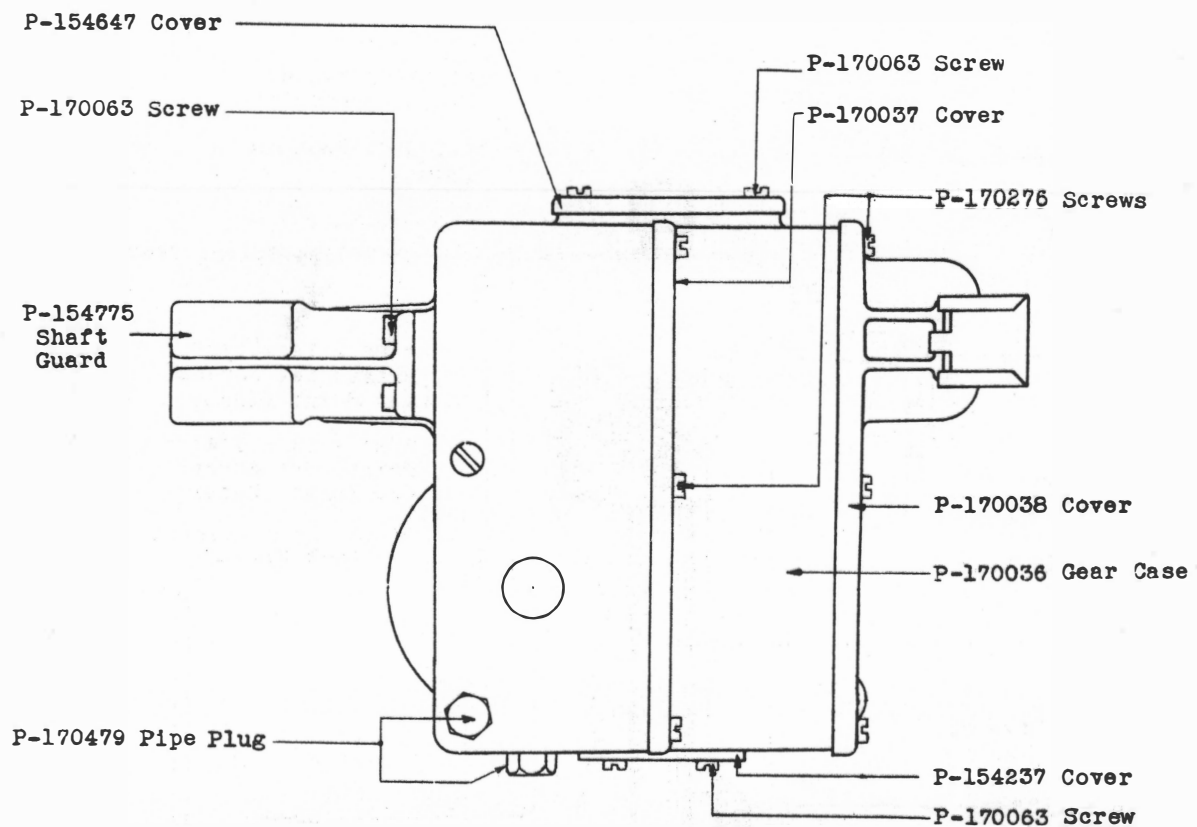


Fig. 15 - External Parts of Gear Case
(No. 30A Drive)

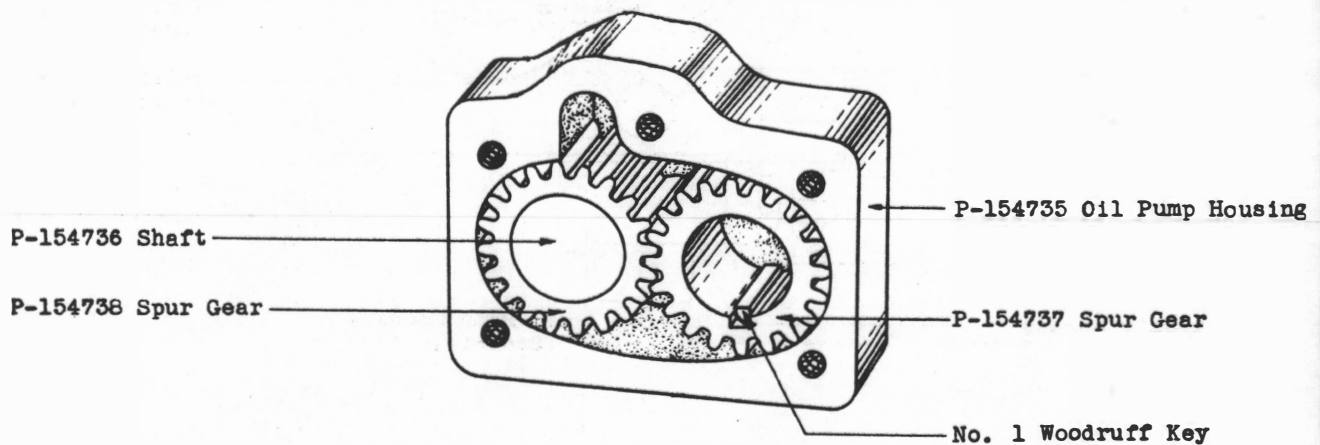


Fig. 16 - Gear Case Oil Pump Assembly
(No. 30A Drive)

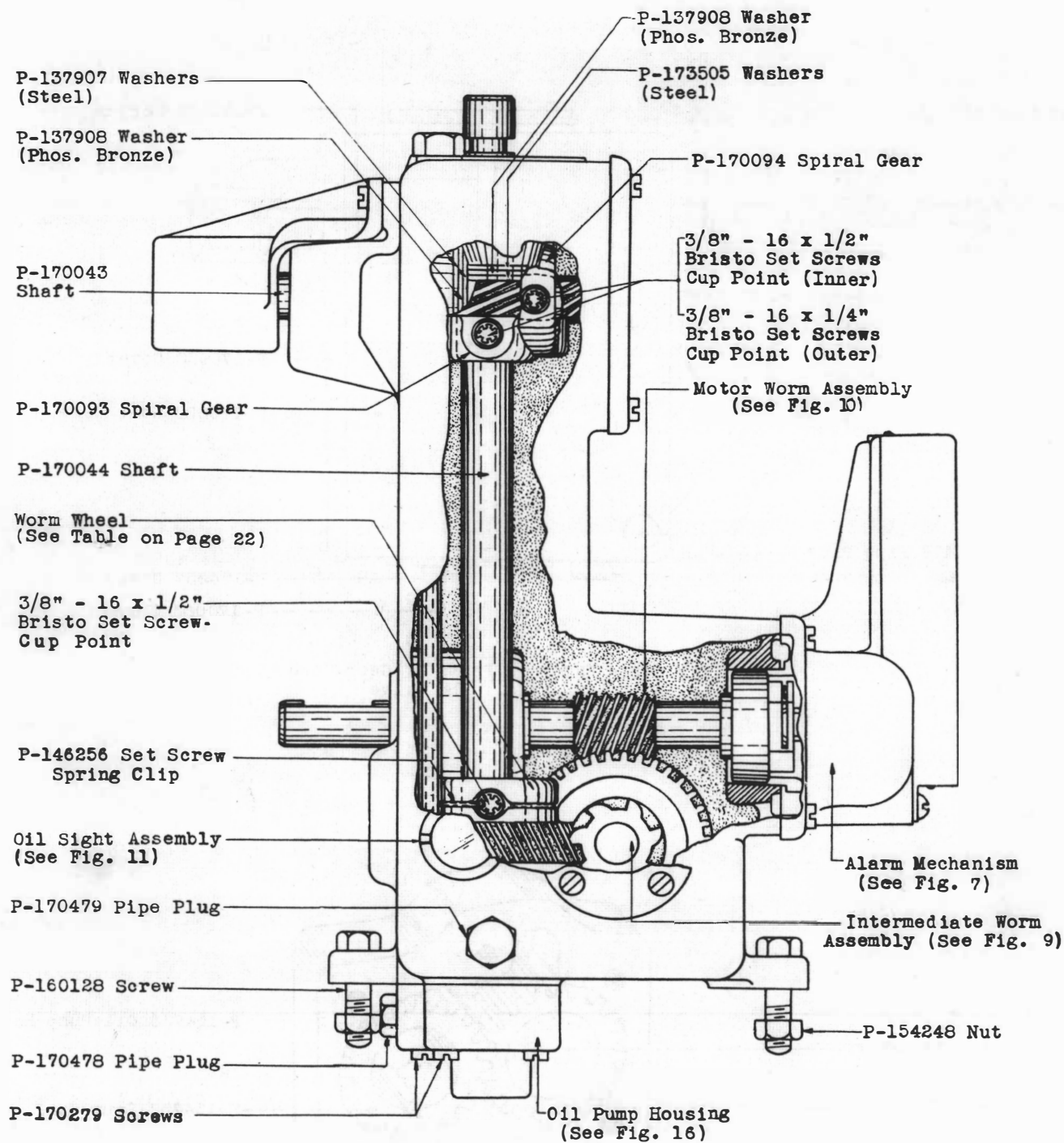


Fig. 17 - Internal Parts of Gear Case
(No. 30A Drive)

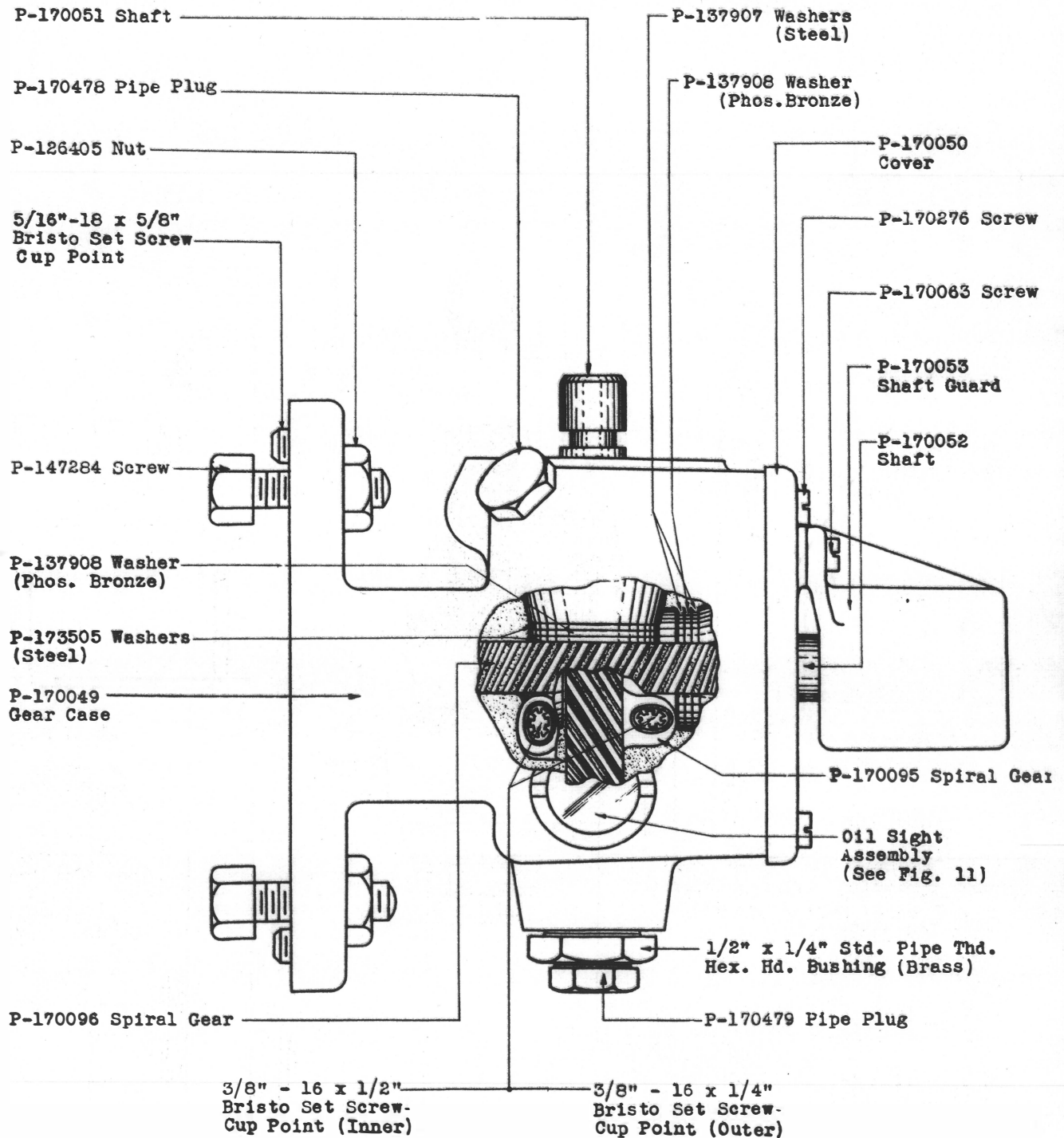


Fig. 18 - Internal and External Parts of Gear Case (No. 31A Drive)

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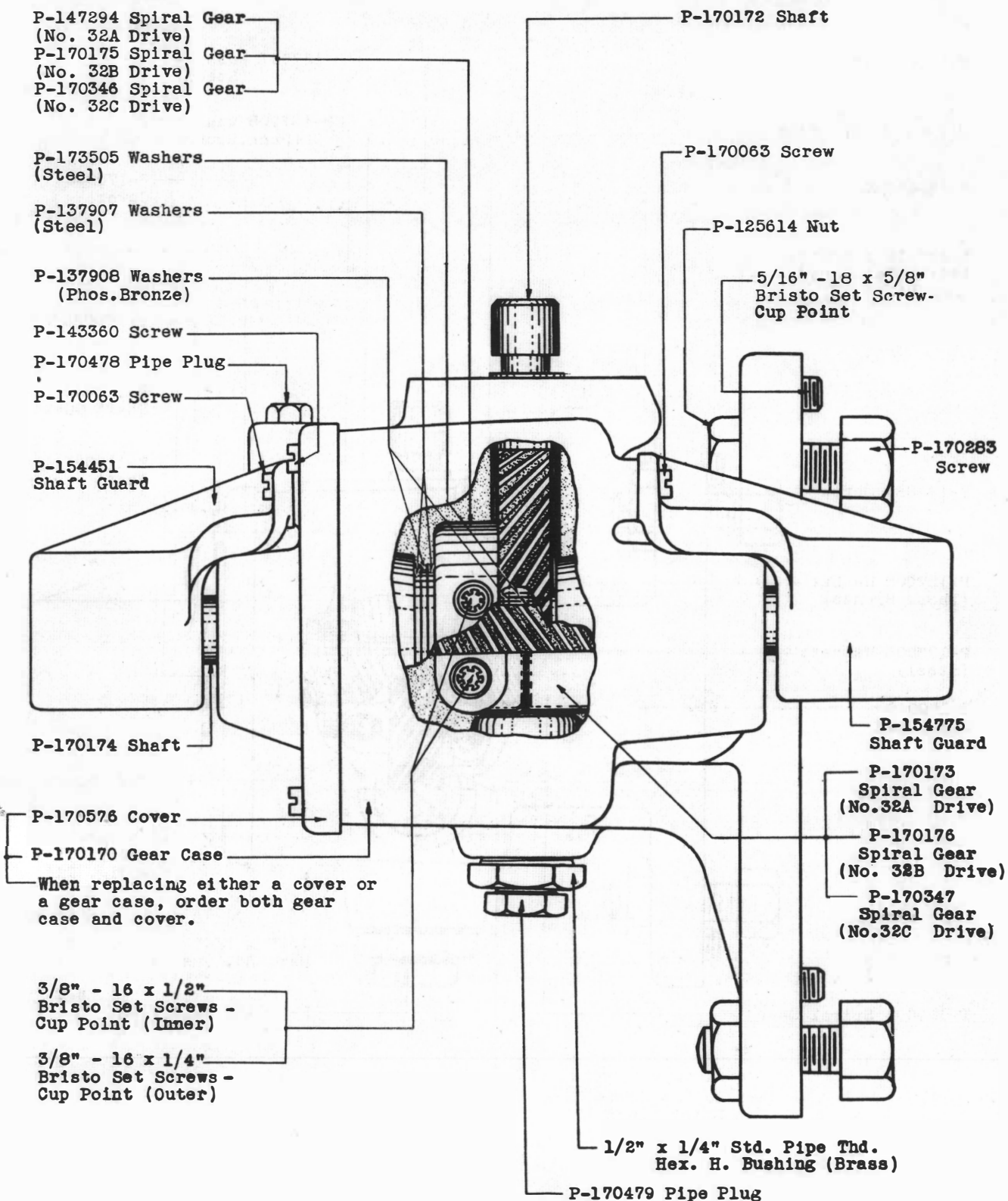


Fig. 19 - Internal and External Parts of Gear Case
(Nos. 32A, B and C Drives)

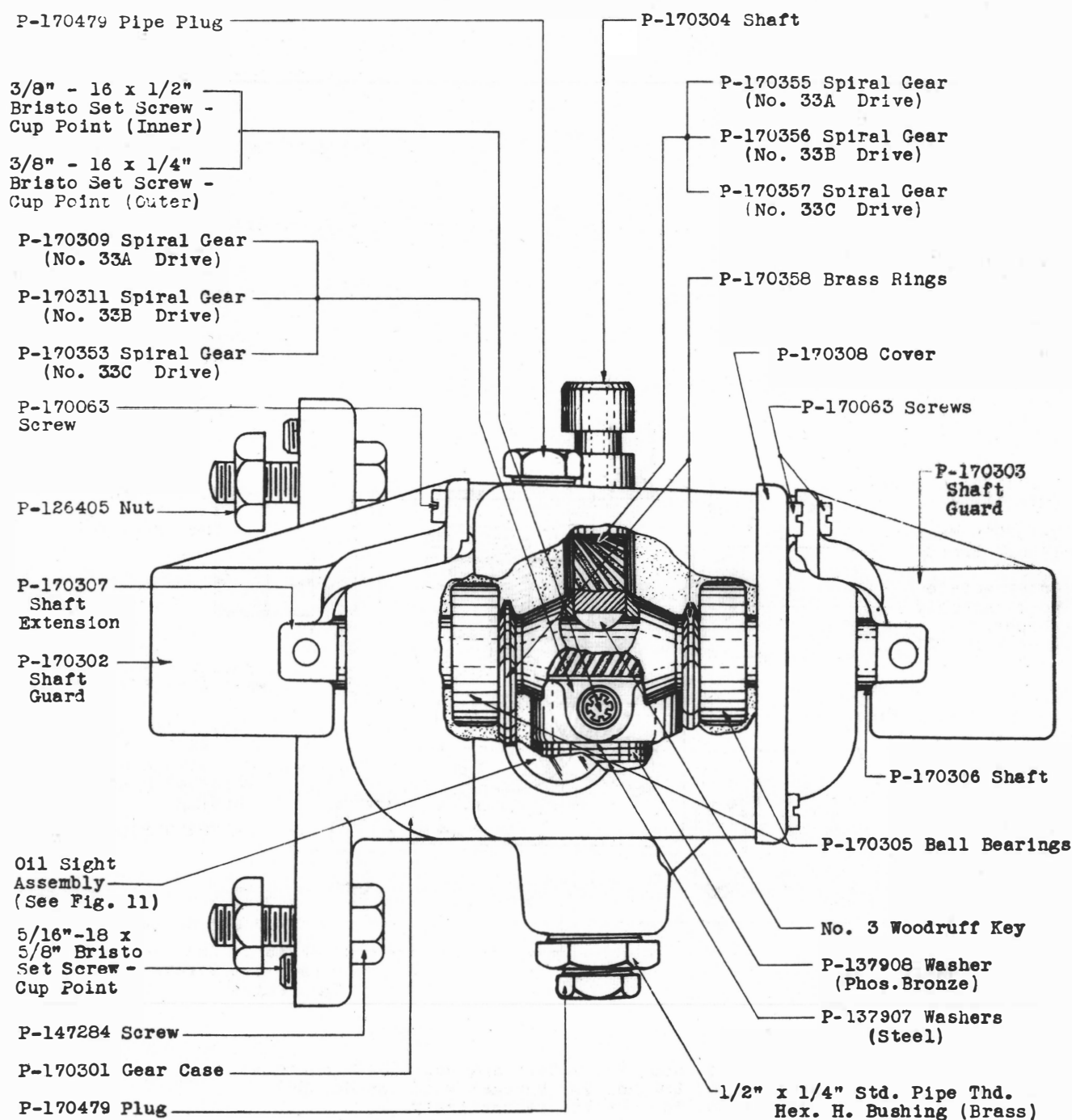
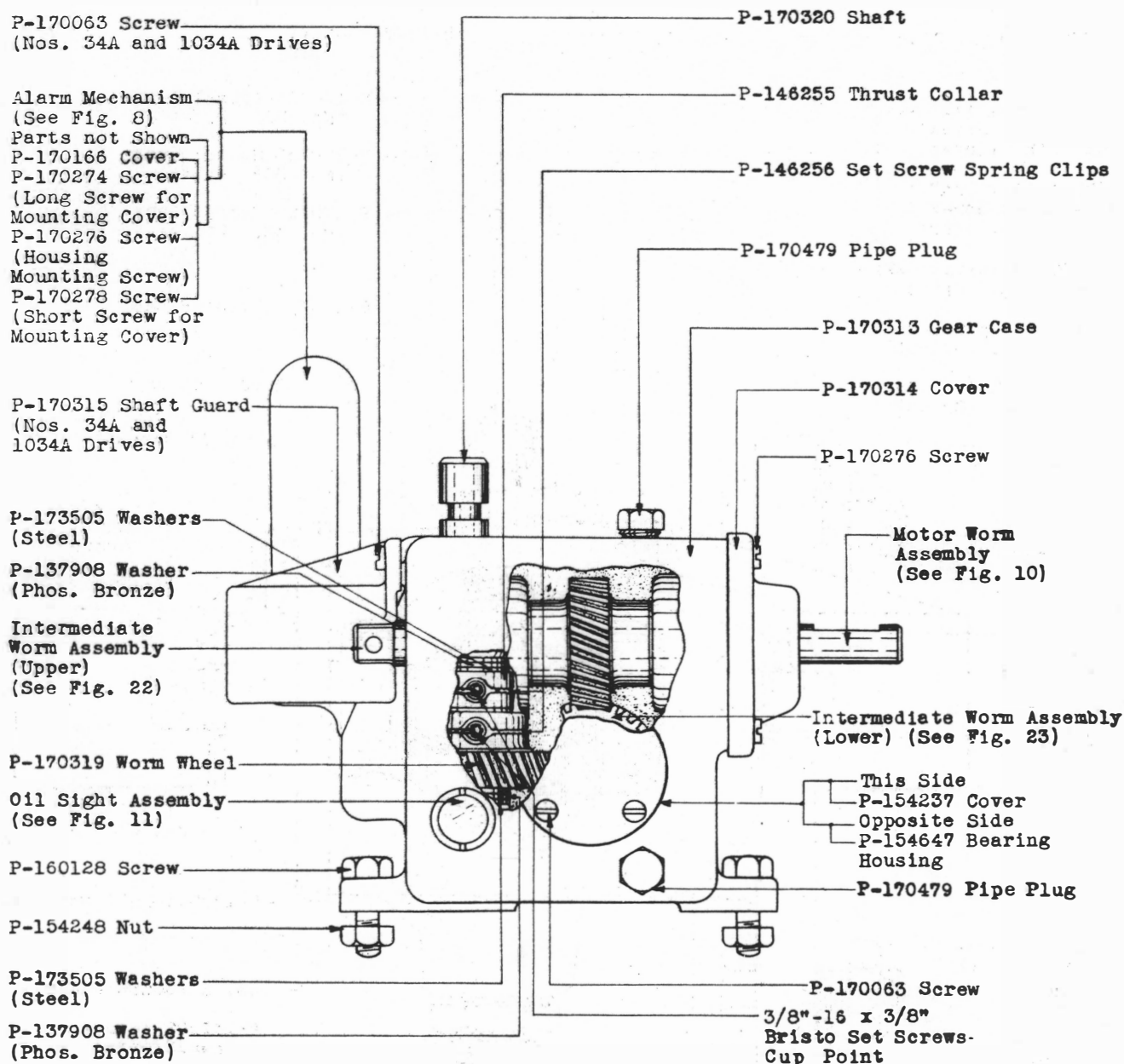


Fig. 20 - Internal and External Parts of Gear Case
(Nos. 33A, B and C Drives)



Note: The drives coded No. 1034A and No. 1034B cover the assembly of the No. 9A Bracket with the No. 34A and the No. 34B Drive, respectively.

Fig. 21 - Internal and External Parts of Gear Case
(Nos. 34A, B, 1034A and B Drives)

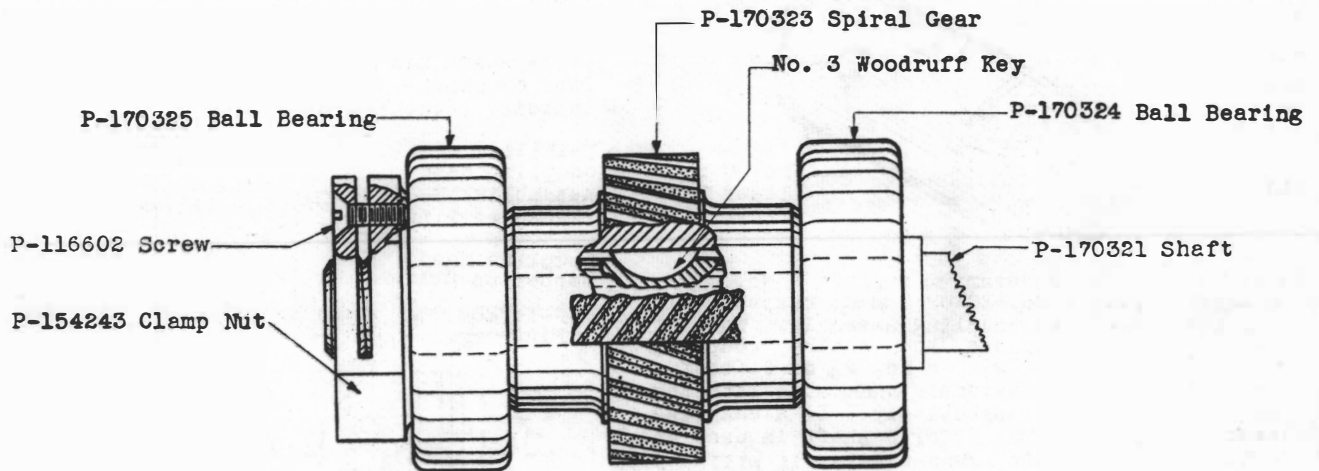


Fig. 22 - Intermediate Worm Assembly
(Upper) (Nos. 34A and 1034A
Drives Only)

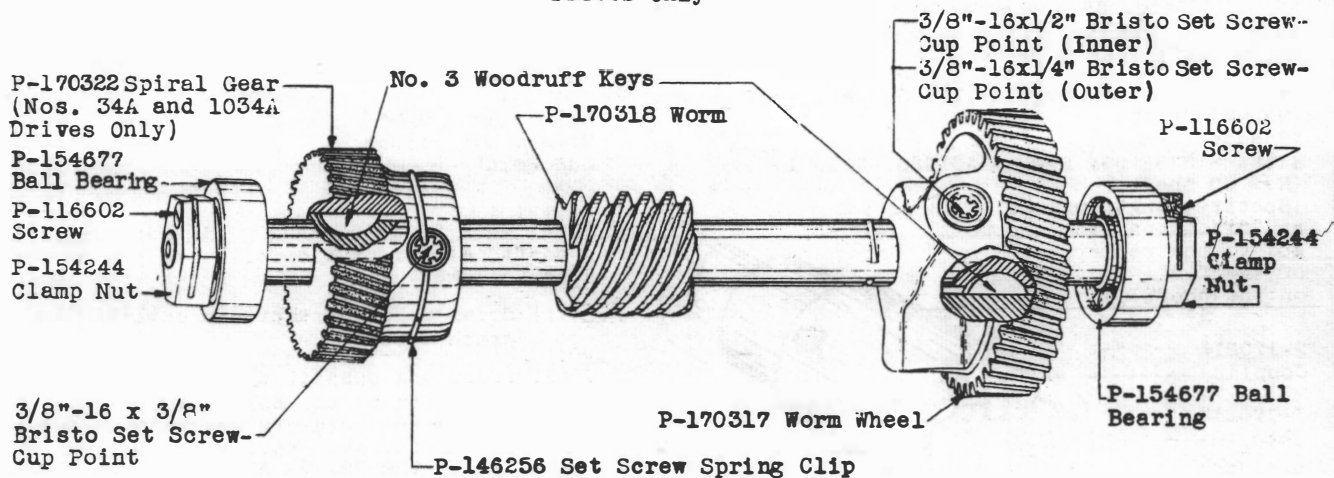


Fig. 23 - Intermediate Worm Assembly
(Lower) (34 and 1034 Type Drives)

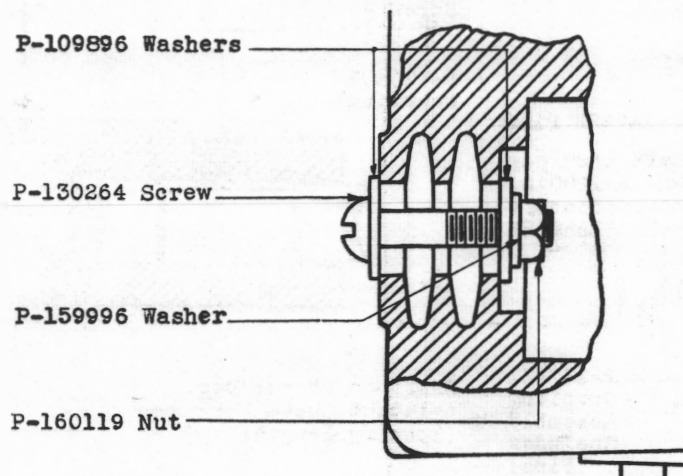
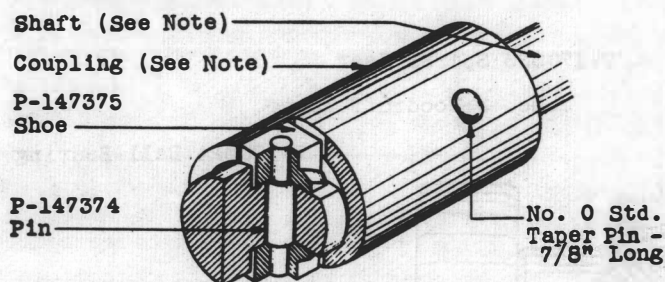


Fig. 24 - Gear Case Cover Arrangement
(Nos. 34B and 1034B Drives Only)

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Note: When it is necessary to replace a No. 2A or B shaft, order a No. 2C or D shaft respectively and the associated coupling assembly. When it is necessary to replace the entire coupling assembly associated with a No. 2A or B shaft, order the coupling assembly associated with the No. 2C or D shaft respectively. If a coupling associated with a No. 2C or D shaft is used on a No. 2A or B shaft respectively, it will be necessary to file a flat on the shaft for the Bristo set screw.

Fig. 25 - Nos. 2A and B Shafts

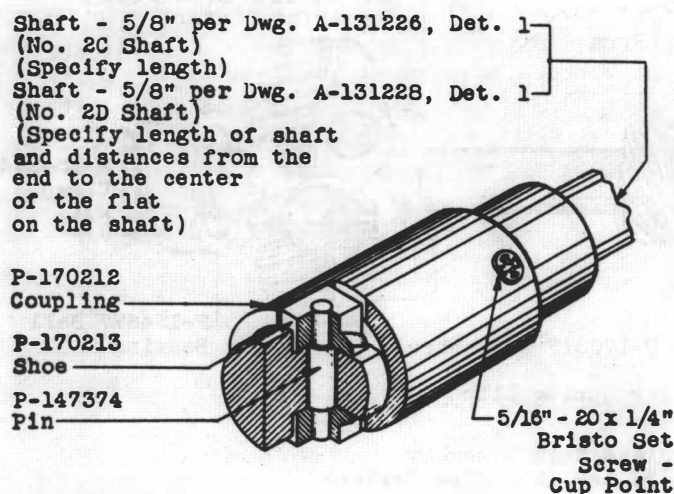


Fig. 26 - Nos. 2C and D Shafts

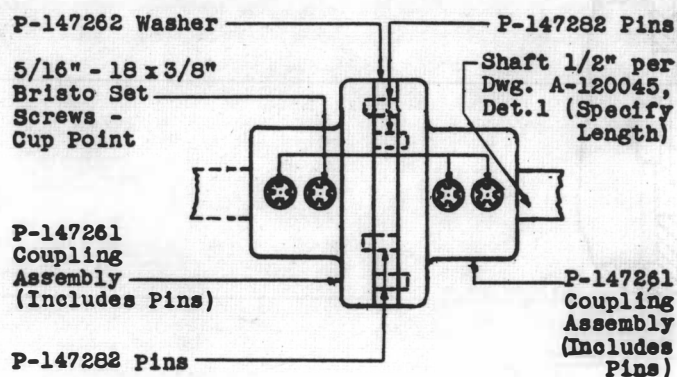
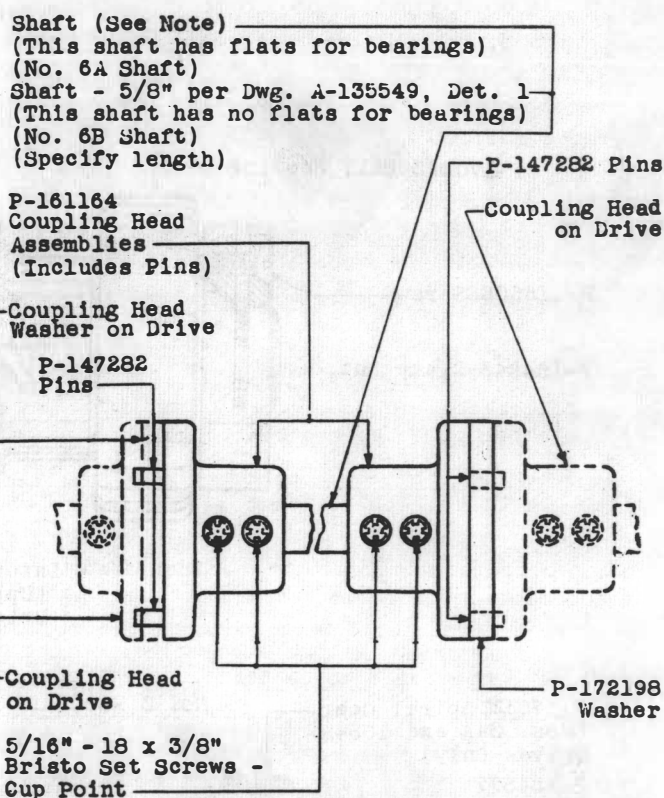


Fig. 27 - No. 3A Shaft



Note: When it is necessary to replace a No. 6A shaft, either of the following procedures may be followed.

- (1) Order a No. 6A shaft as outlined in paragraph 2.03.
- (2) Order and substitute for the shaft, the No. 6B shaft and as many P-290005 ball bearing assemblies as there are bearings on the shaft. Substitute the new bearing assemblies for those mounted on the No. 6A shaft.

Fig. 28 - Nos. 6A and B Shafts

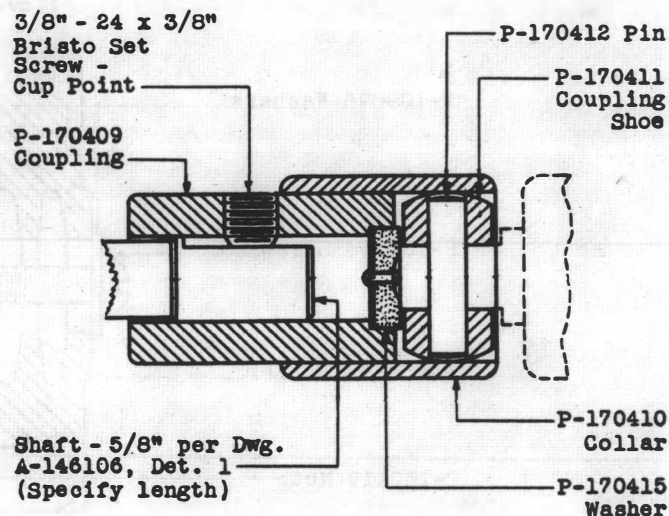


Fig. 29 - No. 10A Shaft

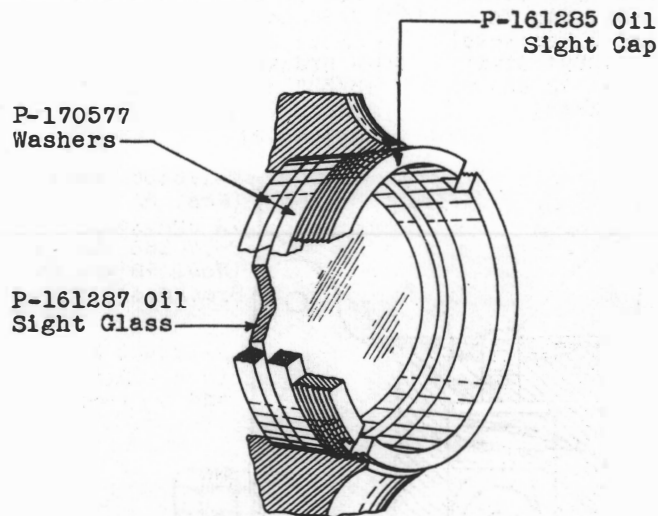


Fig. 30 - Oil Sight Assembly
(All Bearings)

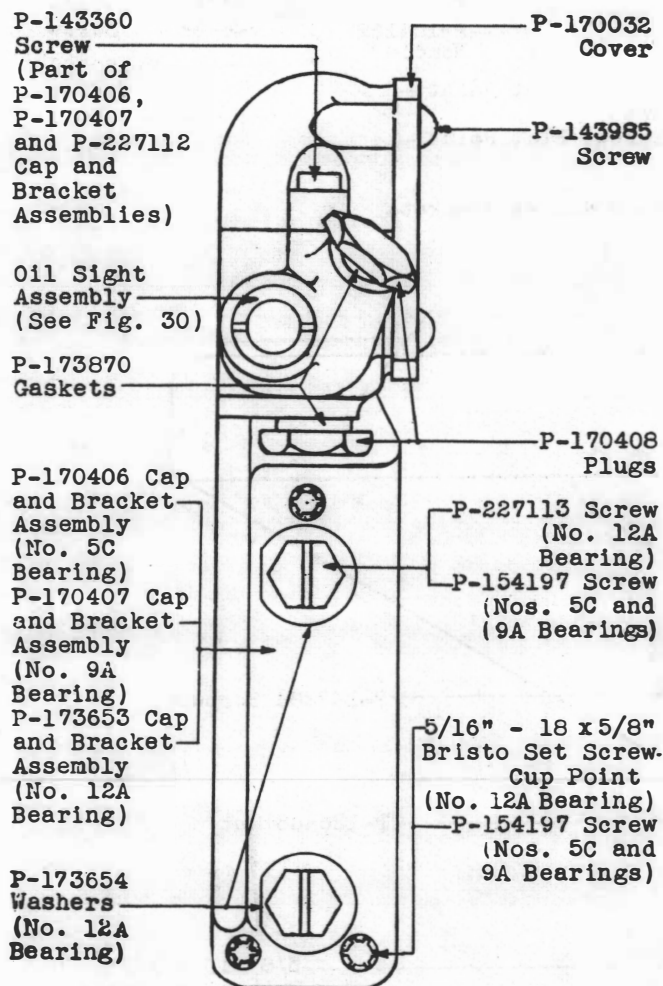


Fig. 31 - External Parts of Bearings
(Nos. 5C, 9A and 12A Bearings)

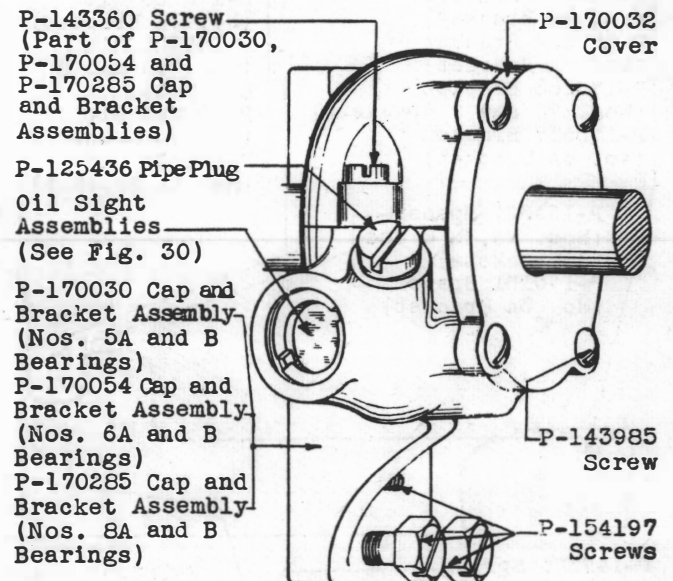


Fig. 32 - External Parts of Bearings
(Nos. 5A, B, 6A, B, 8A and B Bearings)

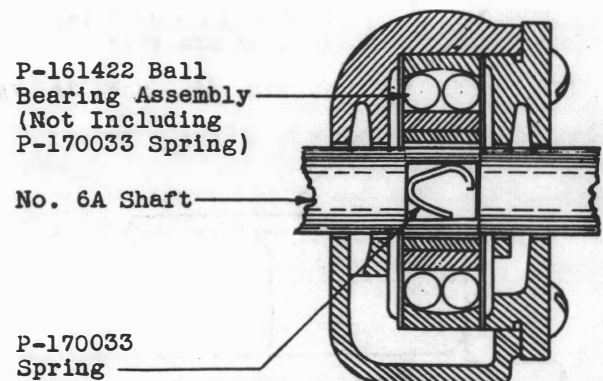


Fig. 33 - Internal Parts of Bearings
(Nos. 5A, 6A and 8A Bearings)

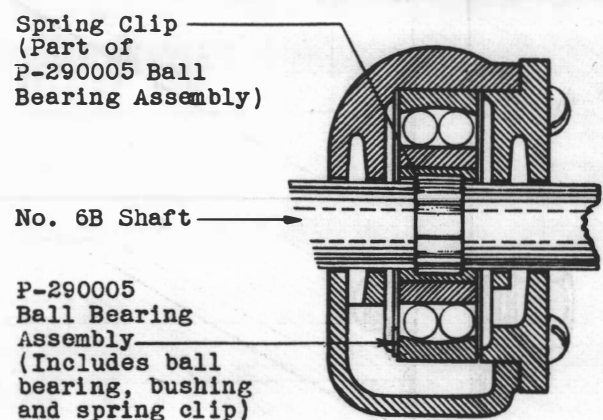


Fig. 34 - Internal Parts of Bearings
(Nos. 5B, C, 6B, 8B, 9A and 12A Bearings)

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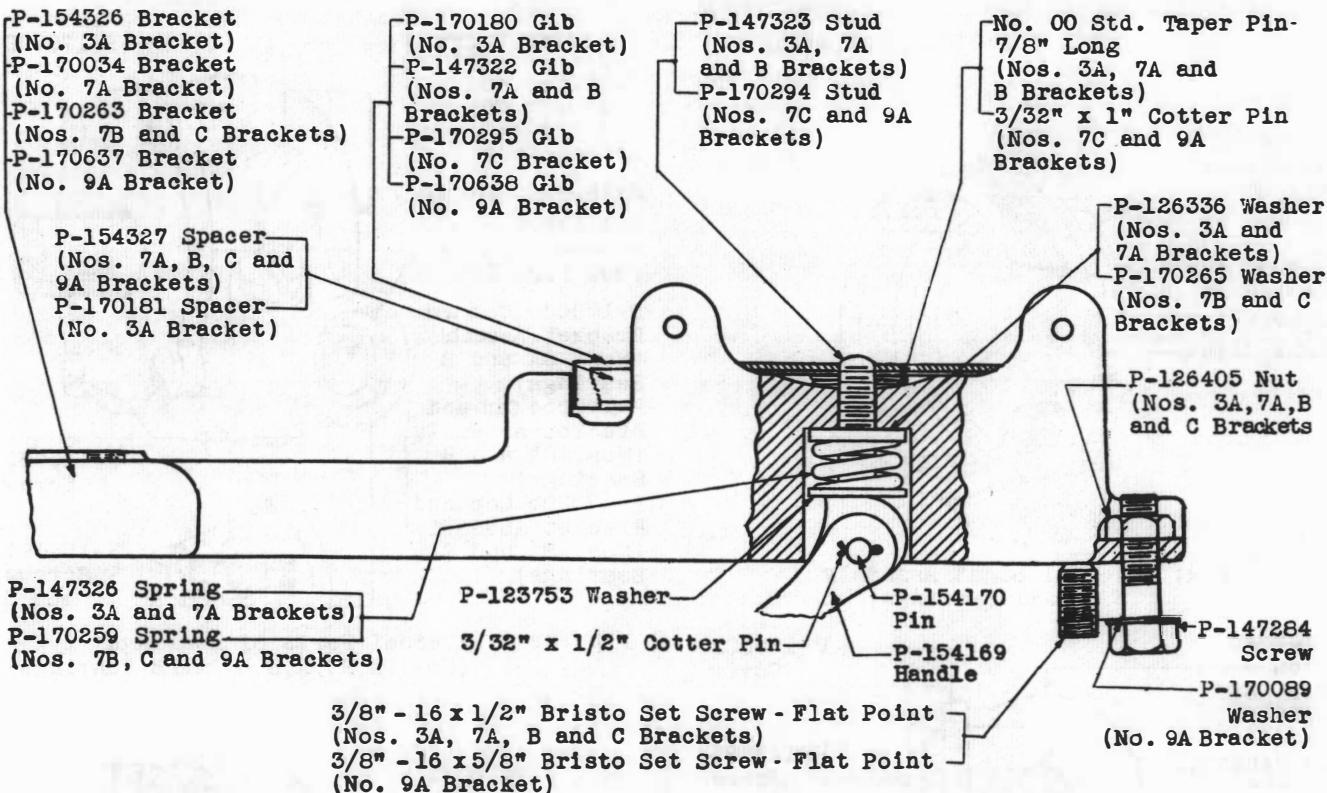


Fig. 35 - Nos. 3A, 7A, B, C and 9A Brackets

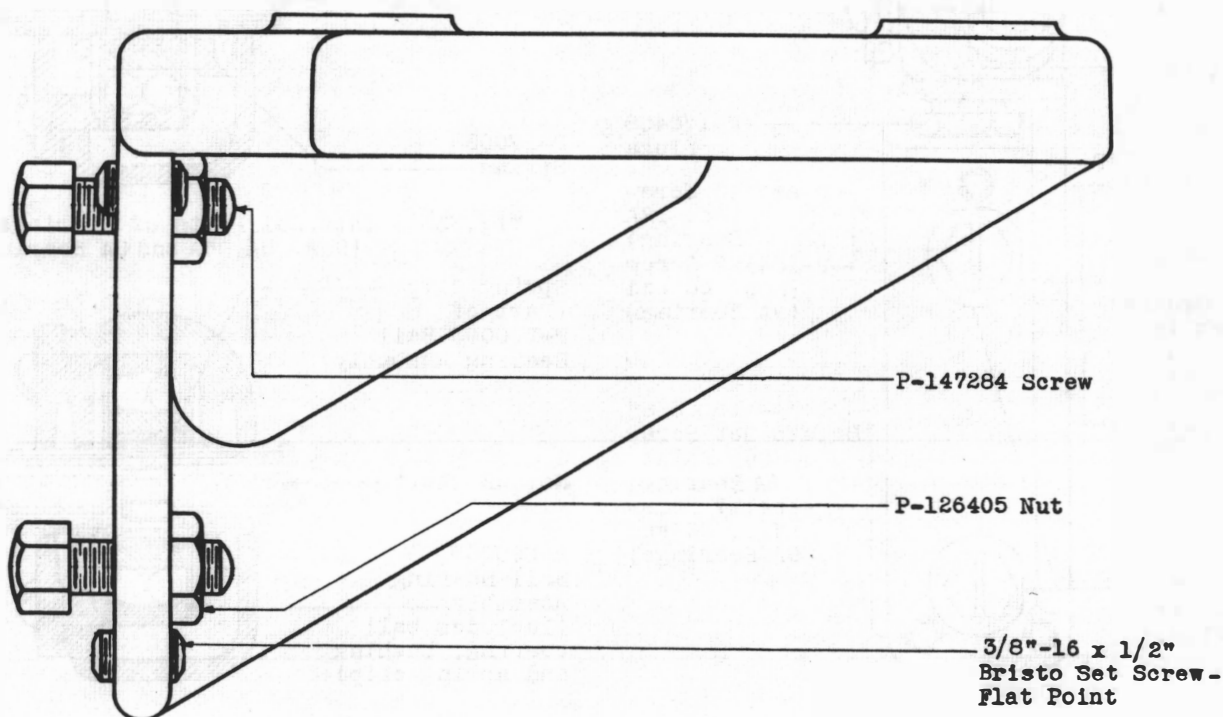


Fig. 36 - No. 11A Bracket

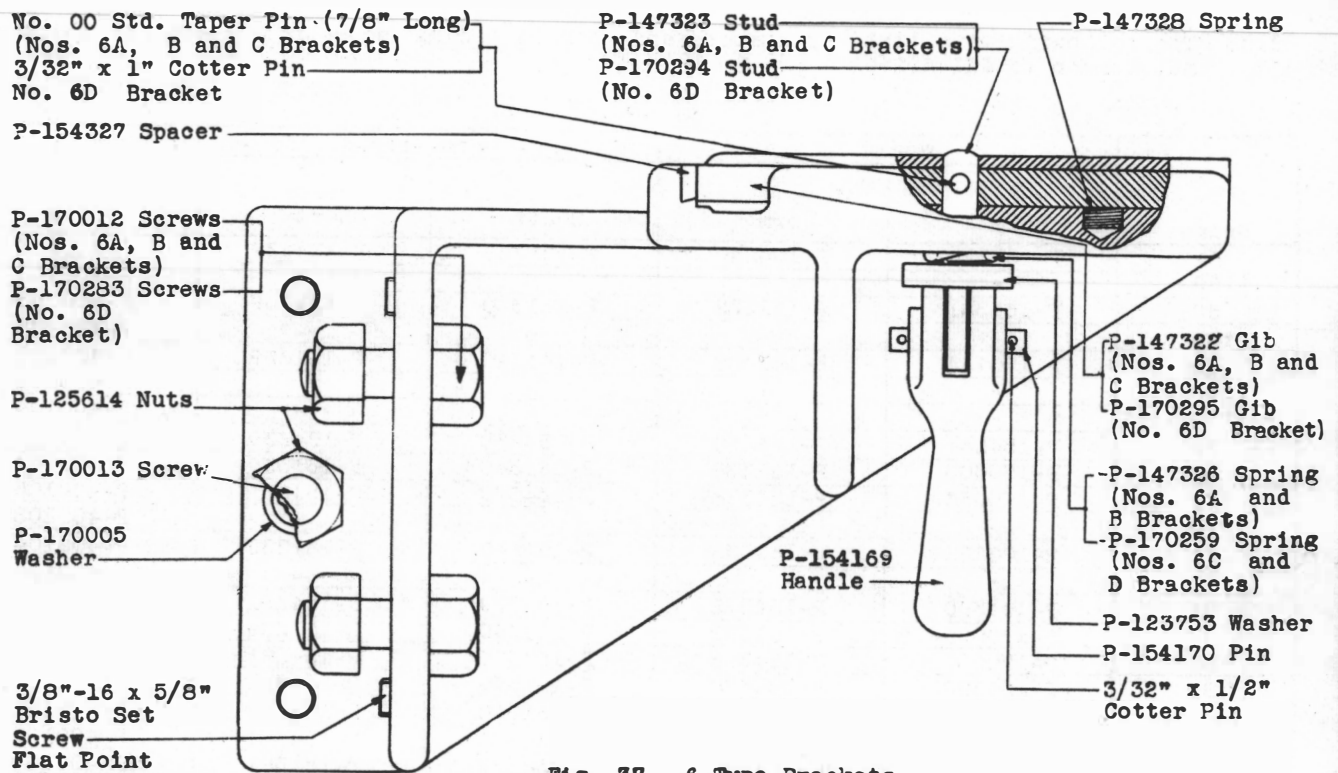


Fig. 37 - 6 Type Brackets

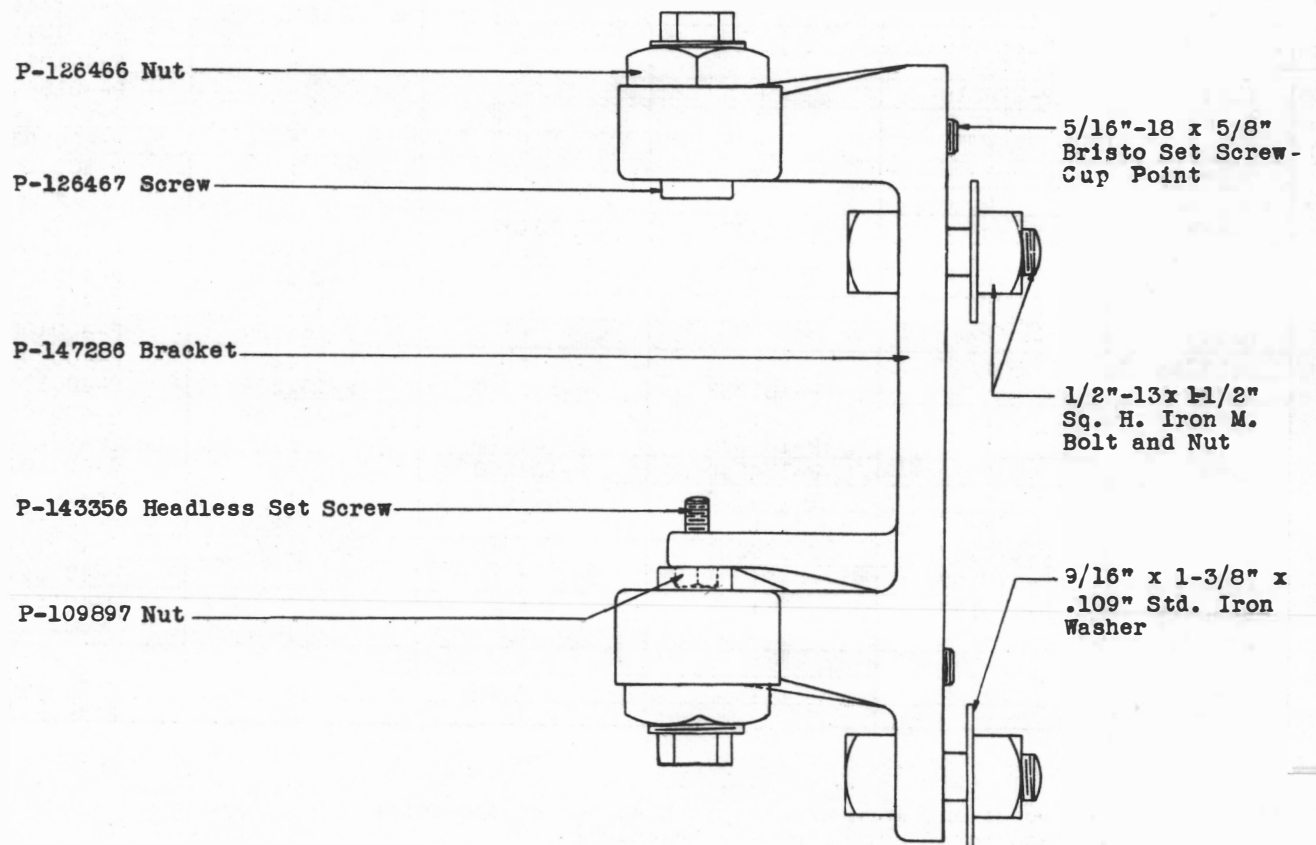


Fig. 38 - No. 12A Bracket

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2.08 The following is a list of numbers and corresponding names of piece parts which are not common to all drives.

Drives	Worms		Worm Wheels		Motor Coupling Guard
	Motor Worm	Intermediate Worm	Vertical Shaft	Intermediate Shaft	
6A	P-154374	P-154240	P-154238	P-154239	P-400103
††6B	-	-	-	-	P-400103
6C	P-161341	P-161338	P-161340	P-161339	P-400103
††6D	-	-	-	-	P-400103
6E	P-170164	P-161338	P-161340	P-161339	P-400103
††6F	-	-	-	-	P-400103
††6G	-	-	-	-	P-400104
7A	P-154241	P-154240	P-154238	P-154239	P-400103
7B	P-170003	P-161338	P-161340	P-161339	P-400103
7C	P-170056	P-154378	P-154379	P-154381	P-400105
††7D	-	-	-	-	P-400103
7E	P-170253	P-161338	P-161340	P-161339	P-400104
††7G	-	-	-	-	P-400103
8A	P-154380	P-154378	P-154379	P-154381	P-400104
8B	P-170025	P-161338	P-161340	P-161339	P-400104
8C	P-170021	P-154378	P-154379	P-154381	P-400105
8D	P-154380	P-154378	P-154379	P-154381	P-400104
8E	P-170167	P-161338	P-161340	P-161339	P-400104
8F	P-170168	P-154378	P-154379	P-154381	P-400105
8G	P-170169	P-154378	P-154379	P-154381	P-400104
30A	P-170042	P-154378	P-154379	P-170041	-
34A	P-170316	-	-	-	P-401544
34B	P-170316	-	-	-	P-401544
1034A	P-170316	-	-	-	P-401544
1034B	P-170316	-	-	-	P-401544
D-16792	†	†	†	†	P-400104
D-18624	†	†	†	†	P-400103
D-18625	†	†	†	†	P-400104
†D-18626	†	†	†	†	-
D-43799	†	P-154378	P-154379	†	P-400105
D-76897	†	†	†	P-154239	P-400107
D-76898	†	†	†	P-154239	P-400108
D-76925	†	†	†	P-154239	P-400108
D-77341	†	†	†	P-154239	P-400105
D-77342	†	†	†	P-154239	P-400105
D-78671	†	P-161338	P-161340	P-161339	P-400104
D-78805	†	†	†	P-154239	P-400105
D-78903	†	P-154378	P-154379	†	P-400105
D-78904	†	P-154240	P-154238	†	P-400104
D-78905	†	P-154378	P-154379	†	P-400105
D-80080	†	†	†	P-154239	P-400104
✓D-80920	P-170167	P-170002	P-161340	P-161339	P-400104
D-90210	P-170167	†	†	†	P-401544
D-90211	P-170167	†	†	†	P-401544
D-90217	-	-	†	†	-
D-90218	-	-	†	†	-
D-90242	-	†	†	†	P-401544
D-90243	-	†	†	†	P-401544

Notes

- (†) Order these worms and worm wheels per D number of the Drive.
 (‡) Order gear case per D number of the Drive.
 (✓) Cover (P-170178) omitted and alarm assembly shown on Fig. 7 furnished instead.
 (††) The worms and worm wheels of these drives are not removable without dismantling the associated interrupter. (See note covered on Fig. 13)

3. REPLACEMENT PROCEDURES**3.001 List of Tools and Materials**

<u>Code or Spec.No.</u>	<u>Description</u>
<u>Tools</u>	
232	1-3/8" Hex. Open Single-End Off-set Wrench
240	Scriber
245	3/8" and 7/16" Hex. Open Double-End Flat Wrench
246	1/2" Open Single-End Flat Wrench
295	5/16" Bristo Set Screw Wrench (4 Flutes)
296	3/8" Bristo Set Screw Wrench
344	Offset Screw-driver
388A	3/16" and 1/4" Hex. Open Double End Offset Wrench
453A	Swivel Spanner Wrench
R-1255	31/32" and 1-1/16" Double End Flat Wrench
R-1317	5/8" Hex. Offset Socket Wrench
R-1770	1/2" and 9/16" Hex. Open Double End Flat Wrench
R-2382	7/8" Hex. Open End Flat Wrench
R-2485	5/32" Hex. Socket Setscrew Wrench
R-2812	3/16" Hex. Socket Setscrew Wrench
R-6440	3/8" Sq. Flat Wrench
KS-6367	7/16" and 5/8" Hex. Open End Flat Wrench
KS-8097	7/16" and 5/8" 12 Point Offset Box Wrench
-	Ball Peen Hammer - 1 Lb.
-	Hack Saw Frame
-	6-1/2" P-Long Nose Pliers
-	5/32" Pin Punch
-	3" Cabinet Screwdriver
-	4" Regular Screwdriver
-	5" Regular Screwdriver
-	6" Tweezers
-	11/16" and 25/32" Hex. Open Double End Engineer's Wrench
<u>Materials</u>	
-	Quick Drying Paint (To Match Apparatus)

<u>Code or Spec.No.</u>	<u>Description</u>
KS-7860	Petroleum Spirits
-	Wire and Block (For supporting drive shaft)
-	Receptacles for Drained Oil
-	4-0 AL Sandpaper
KS-6824	Sealing Compound

3.002 Wherever Bristo setscrews are referred to in this section and replacements are required, hexagon socket setscrews of corresponding size and type of point may be used.

3.02 Before stopping a drive to make any of the replacements specified herein, ascertain whether it is necessary to make any of the associated circuits busy. Circuits which are so affected shall be made busy in the approved manner.

3.03 When it is necessary to remove a gear case or bearing cover or any part that will cause oil leakage in order to effect the replacement of any part, allow the oil in the gear case or bearing to drain into a suitable container. To do this, remove the drain and filling plugs with the No. 245, No. 388A, the KS-6367, KS-8097, the R-1770 or the R-6440 wrench, depending on the size of the plug and shape of the plug head.

3.04 If a gear case cover is removed for any reason and the gear case is equipped with an oil screen, remove the oil screen as experience has indicated that it is no longer needed.

3.05 Before replacing any part covered herein, check whether the replacing part is coated with a protective film of grease. If it is, remove the grease with KS-7860 petroleum spirits and then lubricate the part, if required, as outlined in the Division 159 section covering this apparatus.

3.06 After the changes have been made, any part on which a seal may have been broken should be cleaned and resealed as outlined in the Division 159 section covering this apparatus. In some cases it may be more economical to replace screws that have been removed from sealed joints with new screws rather than clean old screws.

3.07 After the gear case or bearing has been reassembled, insert and seal the drain plug in place. Where the drain plug is a taper plug, insert the plug 1/4 of its length into the gear case or bearing box. Then paint the remaining threads with the KS-6824 sealing compound and tighten the plug in place. Where the plug is not a taper plug do not apply the sealing compound to either the plug or gasket. Take care in tightening the plug not to tighten it too tight to avoid shifting the position of the gear case. Where a paraprene gasket is used, an effective seal will not be obtained when

the plug is excessively tightened due to the gasket tending to be squeezed out of place. Paraprene gaskets may be recognized as such by a strong sulphur odor when the gaskets are new.

3.08 After the sealing compound has hardened, touch up the joint with a quick drying paint that matches the original finish.

3.09 After the replacement of any part that requires the draining of the oil, fill the gear case or bearing with oil to the level specified in the Division 159 section covering this apparatus and insert and tighten the filling plug finger tight, except where the plug is a taper plug and is mounted in the face of the cover. In this case, seal the plug as outlined in 3.07.

3.10 After making any replacement of parts of a drive shaft, bearing or associated motor bracket, the part or parts replaced shall meet the readjust requirements involved as specified in the section of Division 159 covering this apparatus. Other parts whose adjustments may have been disturbed by the replacing operations shall be checked to the test requirements and an over-all operation check shall be made of the drive before restoring the circuits to service.

3.11 No replacement procedures are specified for screws or other small parts when the operation consists of a single simple operation.

3.12 Guard (Coupling): To replace a guard, loosen the mounting screws, when necessary, with the 4" regular screwdriver and remove the guard. Substitute the new part and tighten the mounting screws securely.

Coupling Assembly, Pins and Washer

3.13 Coupling Assembly: To replace a coupling assembly remove the guard as outlined in 3.12 and remove the motor. To do this, remove the plugs that furnish the source of power for the motor. Operate the clamping handle located under the bracket and remove the motor and associated coupling assembly from the motor bracket. Take care not to break the motor stop alarm wires. If necessary, disconnect the wires. If the washer requires replacement, remove it and substitute the new part. To replace a coupling assembly, remove the Bristo set screws from the assembly with the No. 295 wrench and remove it from the shaft. Note the condition of the coupling assembly and pins. If the assembly appears satisfactory but the pins are worn, replace the pins as outlined in 3.14. If the assembly appears worn, replace it. Remove the Bristo set screws from the defective part and insert them in place in the new part. Mount the coupling assembly in place but do not tighten

the set screws and remount the motor in place. Slide the coupling that was just mounted forward on its shaft until it is in its correct position and then tighten the set screws securely in place.

3.14 Pins: To replace a pin, place the coupling assembly in a vise with the pins projecting downward. Drive the defective pin from the coupling with the 5/32" pin punch and hammer. Remove the coupling assembly from the vise. Make the necessary substitution of parts and proceed as follows. Hold the pin in place in the coupling assembly so that the pin is perpendicular to the assembly and place the parts in the vise with the pin against one of the jaws of the vise and the coupling assembly against the other jaw. Close the jaws of the vise against the pin and the coupling assembly forcing the pin in its proper position. Remount the assembly in place as outlined in 3.13.

3.15 Washer: To replace the washer, remove the motor as outlined in 3.13 and remove the washer. Substitute the new part in place over the pins and remount the motor.

Alarm Mechanism and Parts

3.16 General: To replace any part of an alarm mechanism proceed as outlined in paragraphs 3.18 to 3.23. Where the cover of the link type alarm mechanism is in one piece, split the cover into two parts as outlined in 3.17 before removing the cover, except when the cover is to be replaced in which case do not split it.

3.17 Splitting Housing Cover When Mounted on Drive: Starting at the long side of the housing cover, scribe a line across the cover, 60° with the long side, to a point just above the boss for the mounting screw on the short side of the cover. Saw the cover along this line with a hack saw to a depth of approximately 1/16" deep. Do not saw the cover all the way through. Remove the cover mounting screw at the top with the 4" regular screwdriver and insert the blade of a 5" regular screwdriver between the cover and the housing at a point directly to the rear of the top screw hole. With the screwdriver in this position as shown in Fig. 39, force the cover from the housing until the cover snaps off at the sawed slot.

Note: In performing this operation it may be necessary to pry the cover and housing slightly apart in order to permit the screwdriver to be inserted. This may be done by inserting the 4" regular screwdriver in the opening provided for access to the alarm spring retaining screws. Do not loosen the cover mounting screws to permit the screwdriver to be inserted as the seal around the lower portion of the cover will be broken.

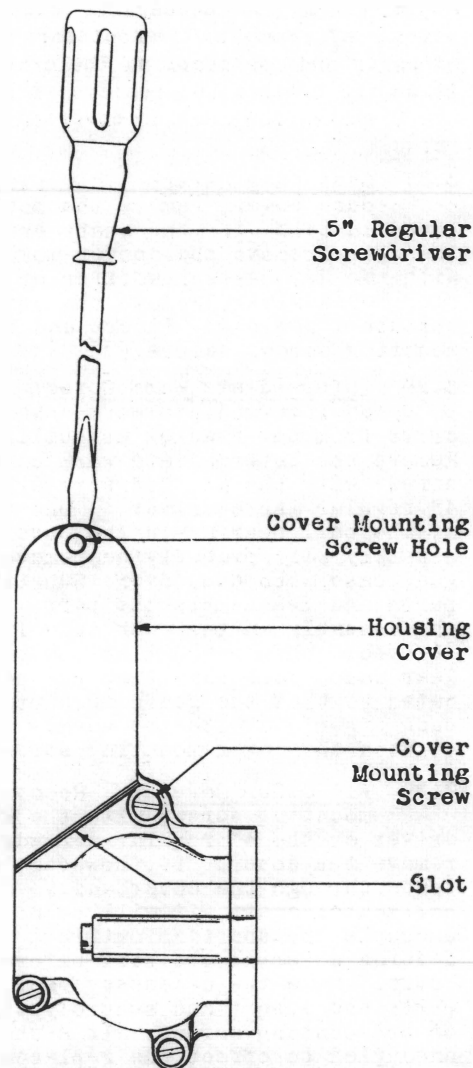


Fig. 39 - Illustrating Splitting of Alarm Housing Cover

3.18 Housing Cover: To replace a cover that is sealed, remove the cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver and remove the cover. The replacing cover is in one piece. In order to eliminate the necessity of breaking oil seals to gain access to the alarm springs or wiring, with the resultant possibility of introducing oil leaks, break the cover into two parts at the slot as follows. Place the straight portion of the cover up to the slot in a vise. Close the vise to hold the cover securely in place. Hit the cover sharply with the hammer at a point above and in a direction away from the slot until the cover is broken into two pieces. In mounting these pieces, seal the lower piece in accordance with approved procedures. Do not seal the upper piece. To replace a cover

that is not sealed, remove the mounting screw with the 3" cabinet screwdriver and remove the cover. Substitute the new part and tighten the screws securely in place. If any seals have been broken clean the surfaces as outlined in 3.06 and refill with oil to the required level as outlined in 3.09.

3.19 Housing: To replace a housing, remove the cover and housing mounting screws with the 4" regular screwdriver as outlined in 3.18 except in the case of the No. 30A drive where the housing is part of the gear case cover. In this case proceed as outlined in 3.61. Remove the contact spring assembly as outlined in 3.23 and mount it in the new housing. Mount the new housing in place and insert and tighten the mounting screws securely. Remount the cover and insert and tighten the mounting screws securely.

3.20 Spring (Retractable Spring): To replace a spring on cast weight alarm mechanisms, remove the housing mounting screws with the 4" regular screwdriver and remove the housing. Remove the spring with the P-long nose pliers. Substitute the new part and remount the housing. Then insert and tighten the mounting screws securely. To replace the spring of a link type alarm mechanism, remove the cover as outlined in 3.18 and remove the spring with the P-long nose pliers. Substitute the new part and remount the cover. Then insert and tighten the mounting screws securely.

3.21 Governor: To replace a governor of either type of alarm mechanism, remove the cover as outlined above and remove the governor housing mounting screws with the 4" regular screwdriver. If a governor of the cast weight alarm mechanism is to be replaced, remove the cotter pin and springs with the P-long nose pliers. Substitute the new part. If this part interferes with the housing, file off a portion of the arm as

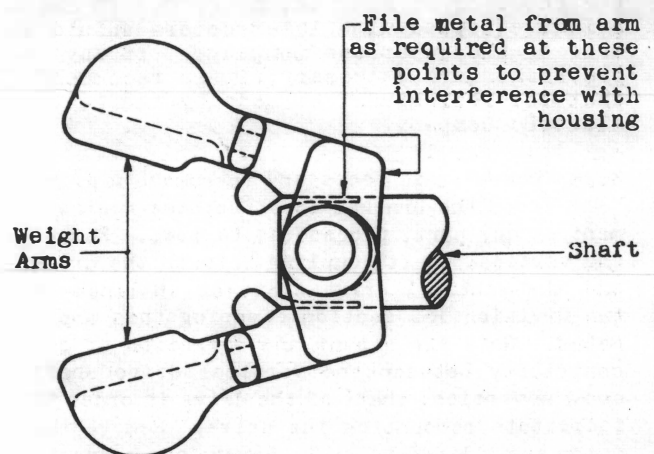


Fig. 40 - Weight Arms of Cast Weight Alarm Mechanism

shown in Fig. 40. Remount the springs and insert the cotter pin and spread the ends to secure it in place. If the governor of a link type alarm mechanism is to be replaced, remove the clamping screws with the 4" regular screwdriver and slide the governor off the shaft. Substitute the new assembly and insert and tighten the screws securely. Remount the governor housing securely in place.

3.22 Pin (Plunger Pin): To replace a pin on alarms having cast weight governors, remove the housing as outlined in 3.19 and remove the cotter pin from the plunger pin with the P-long nose pliers. Remove the pin and substitute the new part. Insert the cotter pin through the pin and remount and secure the housing as outlined in 3.19.

3.23 Contact Spring Assembly: To replace any part of the contact spring assembly, remove the housing cover as outlined in 3.18 and remove the spring assembly mounting screws with the 3" screwdriver. Make the necessary replacement of parts, reassemble the contact spring assembly and insert and tighten the mounting screws securely.

Oil Sight Assembly

3.24 To replace any part of the lower oil sight assembly, remove the oil sight clamping ring with the No. 453A wrench, make the necessary substitution of parts. If the glass is not to be replaced, clean it at this time. Remount and securely tighten the parts in place.

6, 7 and 8 Type Drives

3.25 Drives Equipped With Interrupters: With the exception of the brushes and associated parts no replacement of parts in the interior of Nos. 6B, D, F, G, 7D and G drives equipped with interrupters should be made by the Telephone Company. If any replacements are necessary, it is recommended that the replacement be made by the Western Electric Company.

3.26 Where it is necessary to remove a drive from the bracket to effect the replacement of any part, proceed as follows. Remove the vertical shaft coupling between the drive and the vertical drive shaft as outlined in the Division 159 section covering this apparatus. Note the amount and direction of eccentricity between the vertical drive shaft and the vertical shaft of the drive in order to facilitate remounting the drive. Remove the motor as outlined in 3.13. Remove any connecting shafts as outlined in 3.29. Hold the drive mounting nuts with the No. 246 or R-1770 wrench and remove the mounting bolts with the R-1317 wrench. Take care not to break the motor stop

alarm wires. If necessary, disconnect the wires. After making the necessary replacement of parts and reassembling the drive, remount it on the bracket and realign as outlined in the Division 159 section covering this apparatus.

3.27 Gear Case Cover: To replace a gear case cover, remove the motor as outlined in 3.13 if the shaft extends through the cover, remove the cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. Remove the cover and substitute a new one. Insert and tighten the mounting screws securely.

3.28 Intermediate Worm Cover: To replace an intermediate worm cover, remove the drive from the bracket as outlined in 3.26. Remove the intermediate worm cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. Due to the fit of the ball bearing in the cover, the worm assembly will probably be removed from the gear case with the cover. Substitute the new parts and reassemble the parts and remount the assembly in the gear case if they were removed. When remounting the parts in the gear case, take care that the parts are located so that the gears mesh properly with each other and with the worm. Insert and tighten the cover mounting screws securely.

3.29 All Other Covers: Remove the cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver and remove the cover. If, however, a shaft extends through the cover and is coupled to a horizontal shaft, it will be necessary to uncouple the shaft as outlined in the procedures covering the part before removing the cover. Make the necessary replacement of parts and insert and securely tighten the cover mounting screws. If a shaft has been uncoupled to effect the replacement, recouple it as outlined in the procedures noted above.

Intermediate Worm Assembly

3.30 General: To replace any part of the intermediate worm assembly, remove the drive from the bracket as outlined in 3.26 and remove the intermediate worm cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. Due to the fit of the ball bearing in the cover, the assembly will probably be removed from the gear case with the cover. If it is not, remove it from the gear case. After the necessary replacements have been made, reassemble the parts and remount the assembly in the gear case. When remounting the parts in the gear case, take care that the parts are located so that the gears mesh properly with each other and with the worm. After the parts are satisfactorily aligned, mount the covers in place and insert and tighten the cover mounting screws securely.

3.31 Bearing Clamping Nuts: To replace a bearing clamping nut, remove the bearing clamping nut lock screw with the 3" cabinet screwdriver and remove the nut. Substitute the new part on the shaft, tightening it securely in place. Then insert and tighten the lock screw.

3.32 Ball Bearing: To replace a ball bearing, remove the associated bearing

clamping nut as outlined above and remove the bearing. Substitute the new part and remount the clamping nut as outlined above.

3.33 Worm Wheel: To replace the worm wheel, remove the bearing clamping nut and the ball bearing from the end of the shaft nearest the worm wheel as outlined above. Scribe a line on the shaft against one surface of the worm wheel with the No. 240 scriber so that the new wheel may be correctly located. Remove the outer and inner Bristo set screws with the No. 296 wrench. Slide the wheel off the shaft. Insert the inner Bristo set screws loosely in the new worm wheel and place it on the shaft in the position formerly occupied by the worm wheel that was removed. Tighten the inner Bristo set screws securely and insert and tighten the outer Bristo set screws securely. Remount the bearing and clamping nut that were removed as outlined above.

3.34 Worm: To replace the worm, remove the ball bearings and worm wheel as outlined in 3.32 and 3.33 and place them on the new worm. Before removing the worm wheel, note its position on the shaft and locate it on the new shaft in a corresponding position. After aligning the parts, tighten the inner Bristo set screws securely and insert and tighten the outer Bristo set screws securely.

Motor Worm Assembly

3.35 General: To replace any part of the motor worm assembly, remove the intermediate worm assembly from the gear case as outlined in 3.30. Remove the motor and motor coupling assembly mounted on the worm shaft as outlined in 3.13. If the worm shaft is coupled to a horizontal shaft, remove the coupling as outlined in the procedures covering the part. If the worm shaft is connected to an alarm mechanism, remove the housing as outlined in 3.19. Do not remove the governor at this time unless the replacement is to be made on the governor end of the shaft. Remove the cover through which the motor shaft projects as outlined in 3.29. After the necessary replacements have been made, mount the alarm governor on the shaft, if it is used, as outlined in 3.19. After remounting the motor worm assembly in the gear case, remount the intermediate alarm assembly as outlined in 3.30, mount the covers that were removed, as outlined in 3.29, recouple the connecting shaft and the motor coupling assembly and remount the motor as outlined in 3.13.

3.36 Bearing Clamping Nut: To replace a bearing clamping nut, remove the bearing clamping nut lock screw with the 3" cabinet screwdriver and remove the nut. Substitute the new part on the shaft, tightening it securely in place. Then insert and tighten the lock screw.

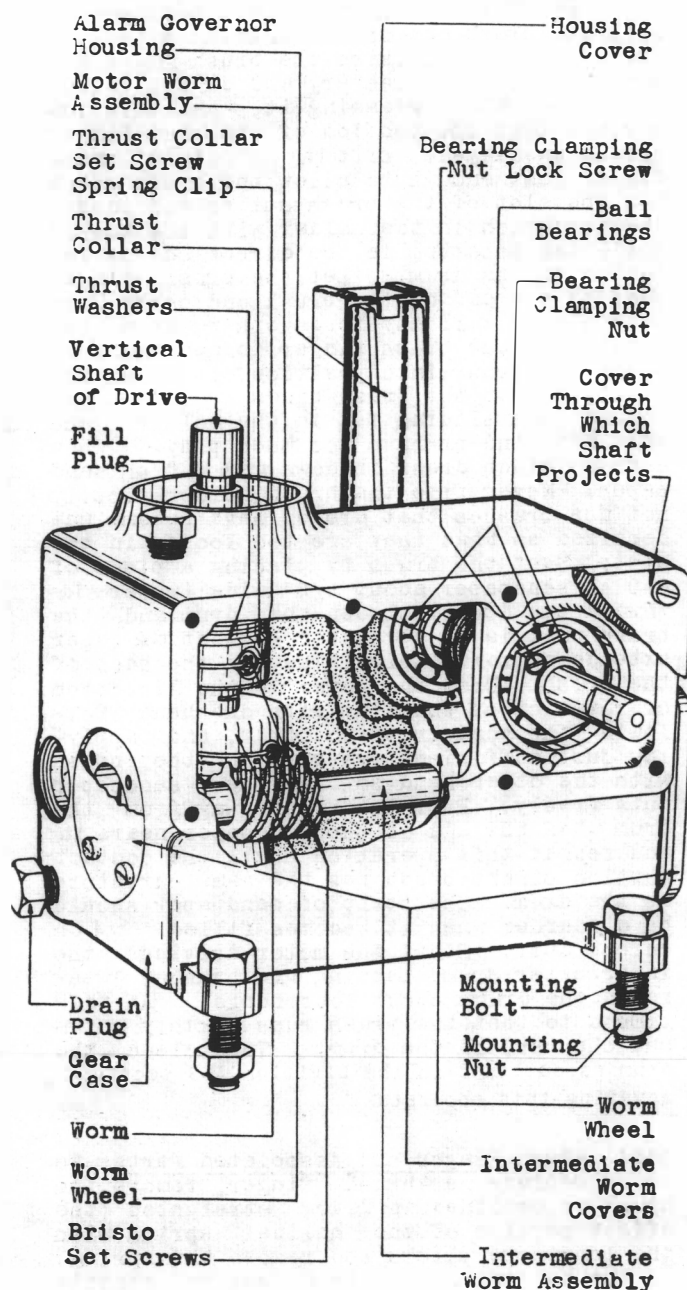


Fig. 41 - 6, 7, and 8 Type Drives

3.37 Ball Bearing: To replace a ball bearing, remove the associated bearing clamping nut as outlined in 3.36 and remove the bearing. Substitute the new part and secure the clamping nut.

3.38 Worm: To replace a worm, remove the bearing clamping nuts and ball bearings from each end of the shaft as outlined in 3.36 and 3.37 and mount them in position on the new worm. Remount the assembly in the gear case as outlined in 3.35.

Worm Wheel Mounted on Vertical Shaft, Thrust Collar and Thrust Washers and Vertical Shaft of the Drive

3.39 General: To replace the vertical shaft of the drive or any part mounted on it, remove the intermediate worm assembly from the gear case as outlined in 3.30. Remove the cover through which the motor shaft projects as outlined in 3.27. After making the necessary replacement of parts, remount the intermediate worm assembly and cover as outlined in 3.30.

3.40 Worm Wheel: To replace the worm wheel, remove the set screw spring clips on the worm wheel and thrust collar with the long nose pliers. Remove the outer and inner Bristo set screws from the worm wheel with the No. 296 wrench and place the inner screws in position in the new worm wheel. Loosen the Bristo set screw in the thrust collar with the No. 296 wrench. Slide the vertical shaft upward until the lower end clears the worm wheel. Remove the worm wheel from the gear case and substitute the new part. To relocate the shaft, place the lower half of an eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down through the parts until the coupling rests on the casting. Slide the worm wheel up to the position which the defective part occupied and tighten the inner Bristo set screws securely. Insert and tighten the outer Bristo set screws securely. Place the thrust collar in its original position and tighten the Bristo set screw securely.

3.41 Thrust Collar and Thrust Washers: To replace a thrust collar or a thrust washer, remove the worm wheel as outlined in 3.40 and remove the thrust collar from the vertical shaft. Remove the Bristo set screw from the collar and place it in the new collar. If a thrust washer is to be replaced, remove the thrust collar and then the washers. Take care when placing the washers in position that the bronze washer is placed between the two steel washers. Place the thrust collar and worm wheel on the shaft in their original positions and tighten the Bristo set screws securely.

3.42 Vertical Shaft of Drive: To replace the vertical shaft of the drive, remove the worm wheel, thrust collar and washers as outlined above. Remove the vertical shaft and substitute the new part, sliding it down through the top of the gear case as outlined above. Relocate the parts that were removed in their original positions as outlined above.

Interrupter Brush Holder and Associated Parts

3.43 Brush: To replace the brush, proceed as follows: Lift the brush finger and pull the brush out of the holder with the tweezers. Do not raise the brush finger any more than it is necessary and do not allow it to snap when releasing it, as it is important that the tension of the brush finger remain unchanged. Lift the associated brush finger just enough to allow the brush to enter the slot of the brush holder and insert the new brush in the holder with the toe of the brush pointing in the direction of rotation of the drum. Let the brush finger bear on the end of the brush and carry it in with a snap. If any force other than the tension of the brush finger is necessary to carry the brush into position, it is an indication that the brush binds. The brush should be a sliding fit in the holder and must not bind or have too much play. When a brush binds dress it down with 4-0 AL sandpaper. Never file the brush holder slot. Do not use brushes that are or have become undersized so that they are too loose in the slot. Seat the brush by placing a piece of 4-0 AL sandpaper about 1/2" wide (paper side toward the drum) between the drum and the brush that is to be seated so that the paper extends approximately 1" beyond the heel of the brush. Draw the paper in the direction of rotation of the drum with one hand, following the contour of the drum, and applying just sufficient pressure on the brush with the other hand so that the sandpaper cuts freely. Pull the brush away from the drum when the end of the sandpaper nears it, and repeat this operation until the contact portion of the brush has the same curvature as the drum. The strip of sandpaper should be discarded when it becomes filled with carbon dust. Start the motor driving the interrupter drum, letting the brushes wear in on the drums about four hours. At this time note that the brush runs smoothly (without chatter) on the drum. Then clean the drum as outlined in the Division 159 section covering this apparatus.

3.44 Brush Finger and Associated Parts: To replace a brush finger, remove the brush as outlined in 3.43, straighten the offset portion of the helical spring with the long nose pliers and remove the spring. If the helical spring is defective, substitute the new part and bend the spring so that it is held securely in place in the brush finger. If the brush finger is defective,

remove the finger mounting nuts with the No. 388A wrench, remove the washer and brush finger. Substitute the new part and reassemble the parts that were removed. Then tighten the finger mounting nuts securely and place the helical spring in position as outlined above.

3.45 Brush Holder and Associated Parts: To replace a brush holder or associated parts, remove the brush holder mounting screws with the 3" cabinet screwdriver and remove the terminals, the brush holder and the insulator. If the spacer is defective, remove it at this time. Substitute the new part and reassemble, tightening the brush holder mounting screws securely.

3.46 Gear Case: To replace the gear case, remove the intermediate worm assembly, motor worm assembly and vertical shaft of the drive as outlined in 3.30, 3.35 and 3.42. Remove the fill and drain plugs, the alarm mechanism and oil sight assembly as outlined in 3.21 and 3.24 respectively. Assemble these parts in the new gear case as outlined in the procedures noted above.

28 Type Drives

3.47 Where it is necessary to remove the drive from the bracket to effect the replacement of any part, proceed as follows. Remove the coupling between the drive and the vertical drive shaft as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Note the amount and direction of eccentricity between the vertical drive shaft and the vertical shaft of the drive. Remove the motor and motor coupling assembly as outlined in 3.13. Uncouple the connecting shafts as outlined in 3.48. Loosen the upper set screw locknut on the bracket with the No. 232 wrench and loosen the set screw with the R-2382 wrench and remove the drive from the frame. After making the necessary replacement of parts and reassembling the drive, remount it on the bracket and tighten the set screw in the bracket securely. Then tighten the locknut securely. Assemble the connecting shafts as outlined in 3.48.

3.48 Shaft Guard: To replace a shaft guard, remove the shaft guard mounting screws with the 4" regular screwdriver or the No. 344 screwdriver, and remove the shaft guard. If the shaft guard is mounted over a horizontal connecting shaft, it will be necessary to uncouple the shaft before removing the shaft guard. To do this, slide the shaft guard away from the drive onto the horizontal shaft. Drive out the taper pin with the hammer and the 5/32" pin punch or loosen the Bristo set screws with the No. 295 wrench. Place a piece of wire around the shaft and fasten the wire to the frame or place a wooden block under the shaft in order to support it and prevent strain on the other

coupling head, and then slip the coupling head off the shaft and then remove the shaft guard. Substitute the new shaft guard. Reassemble the coupling on the connecting shaft. Mount the shaft guard securely in place.

3.49 Gear Case Cover and Gasket: To replace the gear case cover, disconnect the shaft couplings and remove the shaft guard from the side on which the cover is located as outlined in 3.48. Remove the gear case cover mounting screws with the 4" regular screwdriver and remove the cover. Substitute the new part and insert and tighten the mounting screws securely. Remount and realign the horizontal shaft as outlined in procedure 3.13.

3.50 Thrust Collar, Thrust Washer: To replace a thrust collar or thrust washer, remove the shaft guard as outlined in 3.48. Remove the Bristo set screw with the No. 296 wrench and remove the collar from the shaft. Place the Bristo set screw in the new collar and substitute it on the shaft. Tighten the Bristo set screw securely. If the thrust washer is to be replaced, remove the thrust collar and then the washer, sub-

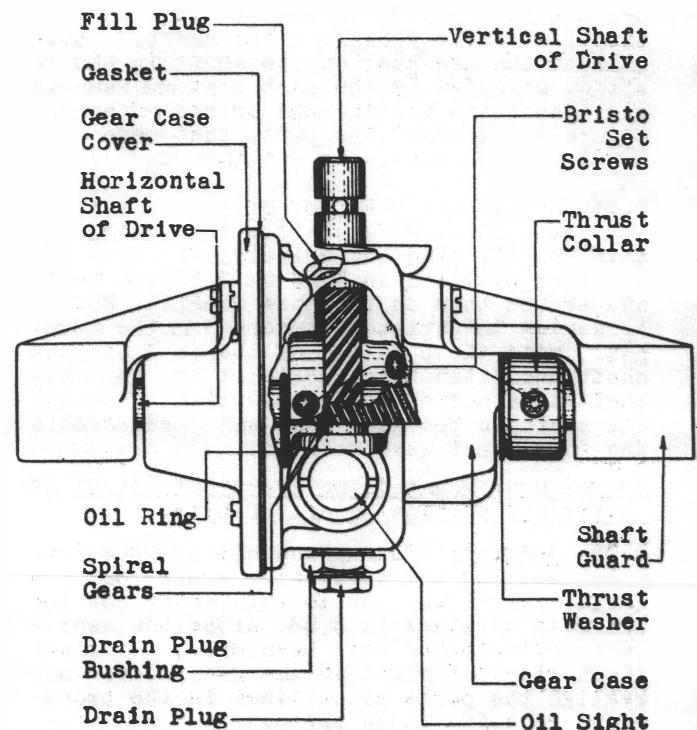


Fig. 42 - 28 Type Drives

stitute the new washer and remount and secure the collar. Remount and realign the horizontal shaft as outlined in 3.48.

Oil Ring, Spiral Gear Mounted on Horizontal Shaft of Drive and Horizontal Shaft of Drive

3.51 General: To replace the oil ring, spiral gear or horizontal shaft of the drive, if necessary remove the gear case from the bracket as outlined in 3.47 and remove the gear case cover and thrust washer as outlined in 3.49 and 3.50, respectively. After making the necessary replacement of parts, reassemble the parts that were removed as outlined in the procedures for those parts. Remount the drive on the bracket and reassemble the parts as outlined in procedures involved.

3.52 Oil Ring: To replace the oil ring, remove the horizontal shaft assembly from the gear case. Remove the oil ring from the shaft. Substitute the new part and remount the shaft assembly in the gear case.

3.53 Spiral Gear Mounted on Horizontal Shaft of Drive: To replace the spiral gear, remove the oil ring from the shaft as outlined in 3.52. Remove the Bristo set screws from the gear with the No. 296 wrench. Scribe a line on the shaft against one surface of the gear with the No. 240 scriber so that the new gear may be correctly located and then remove the gear from the shaft. Substitute the new gear on the shaft in the position occupied by the part that was removed and insert and tighten the Bristo set screws securely. Remount the parts that were removed and reassemble as outlined in 3.51.

3.54 Horizontal Shaft of Drive: To replace the horizontal shaft of the drive, remove the oil ring and spiral gear from the shaft as outlined in 3.52 and 3.53 and mount and secure them on the new shaft. Before loosening the Bristo set screws in the spiral gear, note the position of the gear on the shaft and attempt to locate it on the new shaft in a corresponding position. Remount the shaft in the gear case and reassemble the parts that were removed.

Spiral Gear Mounted on Vertical Shaft of Drive and Vertical Shaft of Drive

3.55 General: To replace either the spiral gear or the vertical shaft of the drive, remove the horizontal shaft of the drive as outlined in 3.54. After the necessary replacements have been made, remount the horizontal shaft in the gear case and realign the parts as outlined in the procedures covering these parts.

3.56 Spiral Gear Mounted on Vertical Shaft of Drive: To replace the spiral gear, remove the outer and inner Bristo set screws with the No. 296 wrench. Slide the vertical shaft upward through the top of the gear case

enough to clear the gear. Remove the gear from the gear case and substitute the new part on the shaft. To relocate the shaft, place the lower half of an eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down through the parts until the coupling rests on the thrust washers. Slide the gear up to the position formerly occupied by the gear that was removed. Insert and tighten the inner and then the outer Bristo set screws securely.

3.57 Vertical Shaft of Drive: To replace the vertical shaft of the drive, remove the spiral gear as outlined in 3.56. Remove the shaft from the gear case and substitute the new part, sliding it down through the top of the gear case and relocate the parts that were removed as outlined in 3.56.

3.58 Gear Case: To replace the gear case, remove the horizontal and vertical shafts of the drive as outlined in 3.54 and 3.57, respectively. Remove the fill plug with the specified wrench and remove the drain plug bushing with the R-1255 wrench. Assemble the parts that were removed in place in the new gear case as outlined in the procedures covering these parts.

No. 30A Drive

3.59 General: Where it is necessary to remove the drive from the bracket to effect the replacement of any part, proceed as follows. Remove the vertical shaft coupling between the drive and the vertical drive shaft as outlined in the Division 159 section covering this apparatus. Note the amount and direction of eccentricity between the vertical drive shaft and the vertical shaft of the drive in order to facilitate remounting the drive. Remove the motor as outlined in 3.13 and the shaft guard as outlined in 3.60. Hold the drive mounting nuts with the R-1317 wrench and remove the mounting bolts with the No. 246 or R-1770 wrench. Take care not to break the motor stop alarm wires. If necessary, disconnect the wires. After making the necessary replacement of parts and reassembling the drive, remount and realign it on the bracket as outlined in the Division 159 section covering this apparatus and then reassemble the vertical shaft coupling as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Reconnect the associated horizontal shaft as outlined in 3.60.

3.60 Shaft Guard: To replace a shaft guard, remove the shaft guard mounting screws with the 4" regular screwdriver or the No. 344 screwdriver and remove the shaft guard. If the shaft guard is mounted over a horizontal connecting shaft it will be necessary to uncouple the shaft before removing the

shaft guard. To do this, slide the shaft guard away from the drive onto the horizontal shaft. Drive out the taper pin with the hammer and the 5/32" pin punch or loosen the Bristo set screws with the No. 295 wrench. Place a piece of wire around the shaft and fasten the wire to the frame or place a wooden block under the shaft in order to support it and prevent strain on the other coupling head, and then slip the coupling head off the shaft and remove the shaft guard. Substitute the new shaft guard. Reassemble the coupling on the connecting shaft. Mount the shaft guard securely in place.

3.61 Gear Case Cover: To replace a gear case cover, proceed as follows except when the alarm housing is part of the gear case cover. Remove the cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. If the alarm housing is part of the gear case cover, remove the plunger pin and contact spring assembly as outlined in 3.22 and 3.23 respectively and mount them on the cover and proceed as outlined above. If removing the drive from the bracket will facilitate replacement of the part, remove the drive as outlined in 3.59. Remove the cover and substitute the new part. Insert and tighten the cover mounting screws securely. Remount and realign the drive if it was removed.

3.62 Intermediate Worm Cover: To replace an intermediate worm cover, remove the drive from the bracket, if necessary, as outlined in 3.59. Remove the intermediate worm cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. Due to the fit of the ball bearing in the cover, the worm assembly will probably be removed from the gear case with the cover. Substitute the new parts and reassemble the parts and remount the assembly in the gear case, if they were removed. When remounting the parts in the gear case, take care that the parts are located so that the gears mesh properly with each other and with the worm. Insert and tighten the cover mounting screws securely.

Oil Pump, Gears and Associated Parts

3.63 Oil Pump Housing: To replace an oil pump housing, remove the oil pump housing mounting screws with the No. 344 screwdriver or the 4" regular screwdriver and remove the oil pump housing from the gear case. Remove the spur gear from the housing and replace it in the new housing. Mount the new housing in place on the gear case and insert and tighten the mounting screws securely.

3.64 Spur Gears: To replace a spur gear, remove the oil pump housing as outlined in 3.63. If the gear to be replaced is mounted on the stub shaft in the housing, remove it and substitute the new gear. If

the gear is mounted on the lower vertical shaft, slide it off the Woodruff key. Substitute the new gear, taking care that the key way in the gear is placed over the key in the shaft. Remount the housing as outlined above.

Intermediate Worm Assembly

3.65 General: To replace any part of the intermediate worm assembly, remove the drive from the bracket as outlined in 3.59 and remove the intermediate worm cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. Due to the fit of the ball bearing in the cover, the assembly will probably be removed from the gear case with the cover. If it is not, remove it from the gear case. After the necessary replacements have been made reassemble

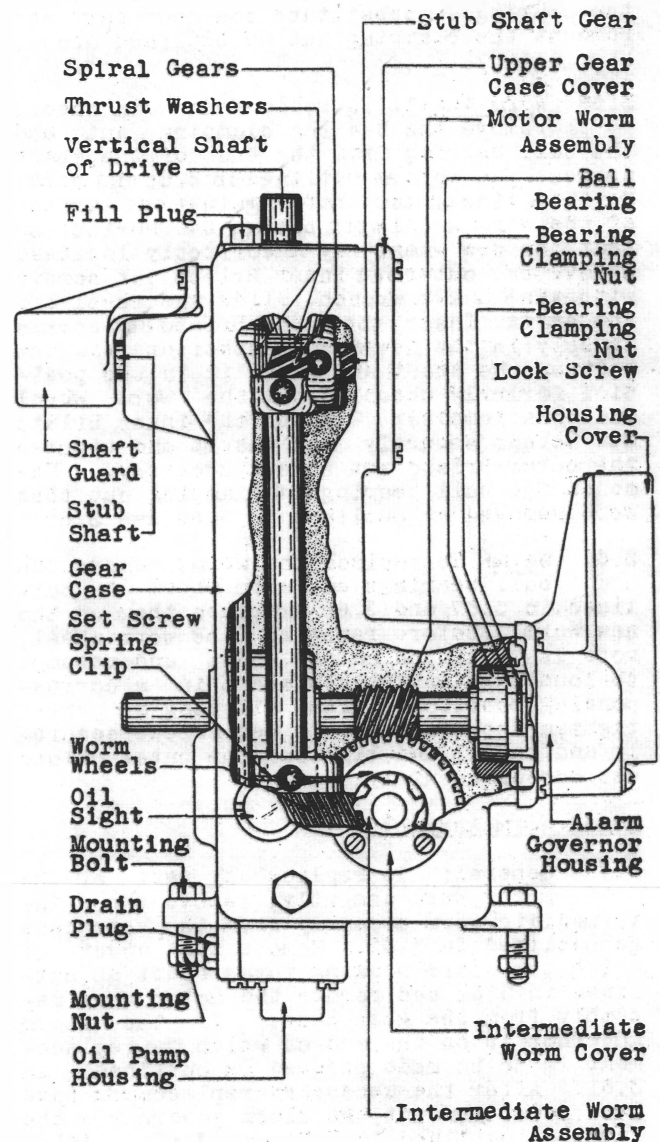


Fig. 43 - No. 30A Drive

the parts and remount the assembly in the gear case. When reassembling the parts in the gear case, take care that the parts are located so that the gears mesh properly with each other and with the worm. After the parts are satisfactorily aligned, mount the covers and insert and tighten the cover mounting screws securely.

3.66 Bearing Clamping Nuts: To replace a bearing clamping nut, remove the bearing clamping nut lock screw with the 3" screwdriver and remove the nut. Substitute the new part on the shaft, tightening it securely in place. Then insert and tighten the lock screw.

3.67 Ball Bearing: To replace a ball bearing, remove the associated bearing clamping nut as outlined in 3.66 and remove the bearing. Substitute the new part and remount the clamping nut as outlined above.

3.68 Worm Wheel: To replace the worm wheel, remove the bearing clamping nut and the ball bearing from the end of the shaft nearest the worm as outlined in 3.66 and 3.67. Scribe a line on the shaft against one surface of the worm wheel with the No. 240 scribe so that the new wheel may be correctly located. Remove the outer and inner Bristo set screws with the No. 295 wrench. Slide the wheel off the shaft. Insert the inner Bristo set screws loosely in the new wheel, substitute the new part on the shaft and place it in the position formerly occupied by the worm wheel that was removed. Tighten the inner Bristo set screws securely and insert and tighten the outer Bristo set screws securely. Remount the ball bearing and clamping nut that were removed as outlined in 3.66 and 3.67.

3.69 Worm: To replace the worm, remove the ball bearings and worm wheel as outlined in 3.67 and 3.68 and place them on the new worm. Before removing the worm wheel, note its position on the shaft and attempt to locate it on the new shaft in a corresponding position. After aligning the parts, tighten the inner Bristo set screws securely and insert and tighten the outer Bristo set screws securely.

Motor Worm Assembly

3.70 General: To replace any part of the motor worm assembly, remove the intermediate worm assembly from the gear case as outlined in 3.65. Remove the cover of which the alarm housing forms a part as outlined in 3.61 and remove the motor worm assembly from the gear case. If the alarm governor is on the end on which the replacement is to be made proceed as outlined in 3.61. After the necessary replacements have been made, remount the alarm governor on the shaft as outlined in 3.21 and 3.22. After placing the motor worm assembly in the gear case, place the intermediate worm assembly

in the gear case as outlined in 3.65 and remount and secure the cover that was removed.

3.71 Bearing Clamping Nut: To replace a bearing clamping nut, remove the bearing clamping nut lock screw with the 3" cabinet screwdriver and remove the nut. Substitute the new part on the shaft, tightening it securely in place. Then insert and tighten the lock screw.

3.72 Ball Bearing: To replace a ball bearing, remove the associated bearing clamping nut as outlined in 3.71 and remove the bearing. Substitute the new part and remount the clamping nut as outlined above.

3.73 Worm: To replace a worm, remove the bearing clamping nuts and ball bearings from the end of the shaft as outlined in 3.71 and 3.72 and mount them in position on the new worm. Place the assembly in the gear case as outlined in 3.70.

Worm Wheel Spiral Gear and Thrust Washers and Vertical Shaft of Drive

3.74 General: To replace a worm wheel, spiral gear or vertical shaft, remove the intermediate worm assembly as outlined in 3.65 and remove the oil pump housing and associated gears from the bottom of the gear case as outlined in 3.63 and 3.64. Remove the cover through which the motor shaft projects and the cover at the end of the intermediate worm assembly as outlined in 3.61. After making the necessary replacement of parts, remount the parts that were removed in accordance with the procedures covering these parts.

3.75 Worm Wheel: To replace the worm wheel, remove the set screw spring clip on the worm wheel with the long nose pliers. Remove the Bristo set screw with the No. 296 wrench. Remove the outer Bristo set screws in the spiral gear and loosen the inner Bristo set screws with the No. 296 wrench. Slide the vertical shaft up through the top of the gear case until it clears the worm wheel and remove the wheel from the gear case and substitute the new part. To mount the shaft, place the lower half of an eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down through the parts until the coupling rests on the thrust washers. Slide the spiral gear to its former position and tighten the Bristo set screw securely. Raise the worm wheel on the shaft to the position formerly occupied by the part that was replaced. Insert and tighten the inner and outer Bristo set screws securely.

3.76 Spiral Gear and Thrust Washers: To replace the spiral gear or a thrust washer loosen the Bristo set screws as outlined in 3.75. Raise the shaft through the top of the gear case until it clears the spiral gear. Remove the gear and substitute

the new part. Slide the shaft down through the gear case and relocate the gear and worm wheel as outlined in 3.75. To replace a thrust washer, remove the spiral gear and then the washers. Substitute the new part and reassemble as outlined in 3.74.

3.77 Vertical Shaft of Drive: To replace the vertical shaft of the drive, remove the parts as outlined in 3.76. Remove the shaft from the gear case and substitute the new part sliding it down through the top of the gear case as outlined above. Relocate the parts as outlined in 3.76.

Stub Shaft Gear, Thrust Washers and Stub Shaft

3.78 General: In order to replace a stub shaft gear, thrust washer or stub shaft, remove the drive from the bracket and remove the cover through which the shaft projects as outlined in 3.59 to 3.61 inclusive. Remove the stub shaft from the gear case. After the necessary replacements have been made, remount the stub shaft in the gear case, place the cover in position securing it with the mounting screws and remount the drive on the bracket as outlined in 3.59.

3.79 Stub Shaft Gear: To replace a stub shaft gear, proceed as follows: Scribe a line on the shaft against the gear with the No. 240 scriber so that the new gear may be correctly located. Remove the outer and inner Bristo set screws with the No. 296 wrench and remove the gear. Substitute the new part and slide it into the position previously occupied by the replaced gear. Insert and tighten the Bristo set screws securely.

3.80 Thrust Washer: To replace a thrust washer, remove the stub shaft gear as outlined in 3.79 and remove the defective washer. Substitute the new part and reassemble as outlined in 3.79.

3.81 Stub Shaft: To replace a stub shaft, remove the stub shaft gear and thrust washers from the shaft as outlined in 3.79. Mount the thrust washers and stub shaft gear on the new shaft and reassemble the parts that were removed as outlined in 3.79 and 3.80.

Gear Case

3.82 To replace a gear case, remove the gear case from the bracket as outlined in 3.59 and remove the parts mounted in the gear case as outlined in 3.63 to 3.81 inclusive. Remove the oil sight assembly as outlined in 3.24. Reassemble and align the parts that were removed in the new gear case as outlined in the procedures covering these parts.

No. 31A Drive

3.83 Where it is necessary to remove the drive from the bracket to effect the replace-

ment of any part, proceed as follows. Remove the coupling between the drive and the vertical drive shaft as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Note the amount and direction of eccentricity between the vertical drive shaft and the vertical shaft of the drive in order to facilitate remounting the drive. Remove the motor and motor coupling assembly as outlined in 3.13 and the shaft guard as outlined in 3.84. Hold the drive mounting nuts with the 11/16" wrench and remove the mounting bolts with the R-1770 wrench. Take care not to change the position of the Bristo set screws which are used to adjust the position of the drive when removing the drive from the bracket. After making the necessary replacement of parts and reassembling the drive, remount it on the bracket and realign as outlined in the Division 159 section covering this apparatus and then reassemble the vertical shaft coupling as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Reconnect the associated horizontal shafts as outlined below.

3.84 Shaft Guard: To replace the shaft guard, remove the shaft guard mounting screws with the No. 344 screwdriver or the 4" regular screwdriver and slide the guard away from the drive onto the horizontal shaft. Drive out the taper pins at each end of the horizontal shaft with the hammer and the 5/32" pin punch or loosen the Bristo set screws with the No. 295 wrench as required. Place a piece of wire around the shaft and fasten the wire to the frame or place a wooden block under the shaft in order to support it and prevent strain on the other coupling and then shift the coupling head back on the shaft and remove the shaft guard to be replaced from the horizontal shaft. Substitute the new part and reassemble the coupling on the connecting shaft. Slide the shaft guard into place and insert and tighten the mounting screws securely.

3.85 Gear Case Cover: To replace a gear case cover, remove the shaft guard as outlined in 3.84 and remove the cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. If removing the drive from the bracket will facilitate replacement of the part, remove the drive as outlined in 3.83. Remove the cover and substitute the new part. Insert and tighten the cover mounting screws securely. Remount and realign the drive if it was removed.

Spiral Gear Mounted on Horizontal Shaft of Drive, Thrust Washers and Horizontal Shaft of Drive

3.86 Spiral Gear Mounted on Horizontal Shaft of Drive: To replace the gear that is mounted on the horizontal shaft, remove

the drive from the bracket as outlined in 3.83. Before removing the spiral gear, scribe a line on the shaft against one surface of the gear with the No. 240 scriber so that the new gear may be correctly located. Remove the Bristo set screws with the No. 296 wrench. Slide the shaft out through the gear case enough to clear the spiral gear. Remove the gear from the gear case. Substitute the new part and slide the gear into the position formerly occupied by the gear which was replaced. Insert and tighten the inner and outer Bristo set screws securely.

3.87 Thrust Washers: To replace a thrust washer, remove the spiral gear as outlined in 3.86 and remove the defective washers. Substitute the new part and reassemble as outlined in 3.86.

3.88 Horizontal Shaft of Drive: To replace the horizontal shaft, remove the spiral gear and thrust washers as outlined in 3.86 and 3.87 and mount them on the new shaft. Remove the defective shaft from the gear case and substitute the new part in the position formerly occupied by the defective shaft and reassemble as outlined in 3.86 and 3.87.

Spiral Gear Mounted on Vertical Shaft of Drive, Thrust Washers and Vertical Shaft of Drive

3.89 Spiral Gear Mounted on Vertical Shaft of Drive: To replace the spiral gear that is mounted on the vertical shaft of the drive, remove the drive from the bracket and remove the gear case cover as outlined in 3.83 and 3.85, respectively. Remove the Bristo set screws with the No. 296 wrench. Slide the shaft up through the gear case until the shaft clears the gear. Remove the gear from the gear case and substitute the new part. To relocate the shaft, place the lower half of an eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down through the parts until the coupling rests on the thrust washers. Slide the gear up into the position formerly occupied by the gear which was replaced. Insert and tighten the inner and outer Bristo set screws securely.

3.90 Thrust Washers: To replace a thrust washer, remove the spiral gear from the vertical shaft of the drive as outlined in 3.89 and remove the defective washer. Substitute the new part and replace the washers on the shaft. Mount the gear in position as outlined in 3.89.

3.91 Vertical Shaft of the Drive: To replace the vertical shaft of the drive, remove or loosen the Bristo set screws in the spiral gear as outlined in 3.89. Remove the shaft from the gear case and substitute the new part, sliding it down through the

top of the gear case as outlined above. Relocate the parts that were removed as outlined in 3.89.

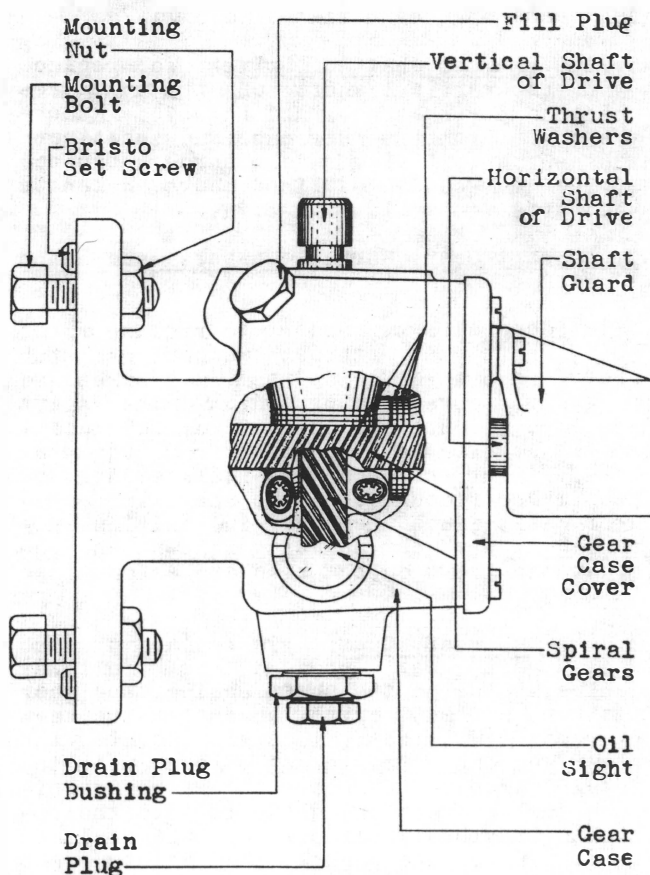


Fig. 44 - No. 31A Drive

Gear Case

3.91 To replace the gear case, remove the gears, thrust washers and shafts from the gear case as outlined in procedures 3.83 to 3.90 inclusive. Remove the fill plug with the KS-6367 wrench and remove the drain plug bushing with the R-1255 wrench. Remove the oil sight assembly as outlined in 3.24. Note the position of the Bristo set screws which are used to adjust the location of the drive on the frame and remove them from the drive with the No. 295 wrench. Run them into the new gear case to the position noted on the defective part. Reassemble and realign the parts that were removed as outlined in the procedures for these parts.

32 Type Drives

3.92 Where it is necessary to remove the drive from the bracket to effect the replacement of any part, proceed as follows: Remove the coupling between the drive and

the vertical drive shaft as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Note the amount and direction of eccentricity between the vertical drive shaft and the vertical shaft of the drive in order to facilitate remounting the drive. Remove the motor and motor coupling assembly as outlined in 3.13 and the shaft guard as outlined in 3.84. Hold the drive mounting nuts with the R-2382 wernch and remove the mounting bolts with the 25/32" wrench. Take care not to change the position of the Bristo set screws which are used to adjust the position of the drive when removing the drive from the bracket. After making the necessary replacement of parts and reassembling the drive, remount it on the bracket and realign as outlined in the Division 159 section covering this apparatus and then reassemble the vertical shaft coupling as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Reconnect the associated horizontal shafts as outlined below.

3.93 Shaft Guard: To replace the shaft guard, remove the shaft guard mounting screws with the No. 344 screwdriver or the 4" regular screwdriver and slide the guard away from the drive onto the horizontal shaft. Drive out the taper pins at each end of the horizontal shaft with the hammer and the 5/32" pin punch or loosen the Bristo set screws with the No. 295 wrench as required. Place a piece of wire around the shaft and fasten the wire to the frame or place a wooden block under the shaft in order to support it and prevent strain on the other coupling and then shift the coupling head back on the shaft and remove the shaft guard to be replaced from the horizontal shaft. Substitute the new part and reassemble the coupling on the connecting shaft. Slide the shaft guard into place and insert and tighten the mounting screws securely.

3.94 Gear Case Cover: If it is necessary to replace a gear case cover, it will be necessary to replace the gear case at the same time. Be sure that the identifying symbols agree when these parts are assembled. To replace the gear case proceed as outlined in 3.101. To remove the cover, remove the shaft guard as outlined in 3.93 and then remove the cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver.

Thrust Washers, Spiral Gear Mounted on Horizontal Shaft of Drive and Horizontal Shaft of Drive

3.95 Thrust Washers: To replace a thrust washer, remove the drive from the bracket and remove the gear case cover as outlined in 3.92 and 3.94. Remove the washer to be replaced. Substitute the new part

and reassemble the parts that were removed as outlined in the procedures covered above.

3.96 Spiral Gear Mounted on Horizontal Shaft of Drive: To replace the gear that is mounted on the horizontal shaft, remove the thrust washers as outlined in 3.95 and remove the horizontal shaft from the gear case. Before removing the spiral gear, scribe a line on the shaft against one surface of the gear with the No. 240 scriber so that the new gear may be correctly located. Remove the Bristo set screws with the No. 296 wrench and remove the gear from the shaft. Substitute the new part and slide the gear into the position formerly occupied by the gear which was replaced. Insert and tighten the inner and outer Bristo set screws securely. Place the thrust washers in position and then remount the horizontal shaft in the gear case.

3.97 Horizontal Shaft of Drive: To replace the horizontal shaft, remove the spiral gear and thrust washers as in 3.96 and mount them on the new shaft and substitute the new shaft and the assembled parts in the gear case. Then remount and secure the parts that were removed as outlined in the procedure above.

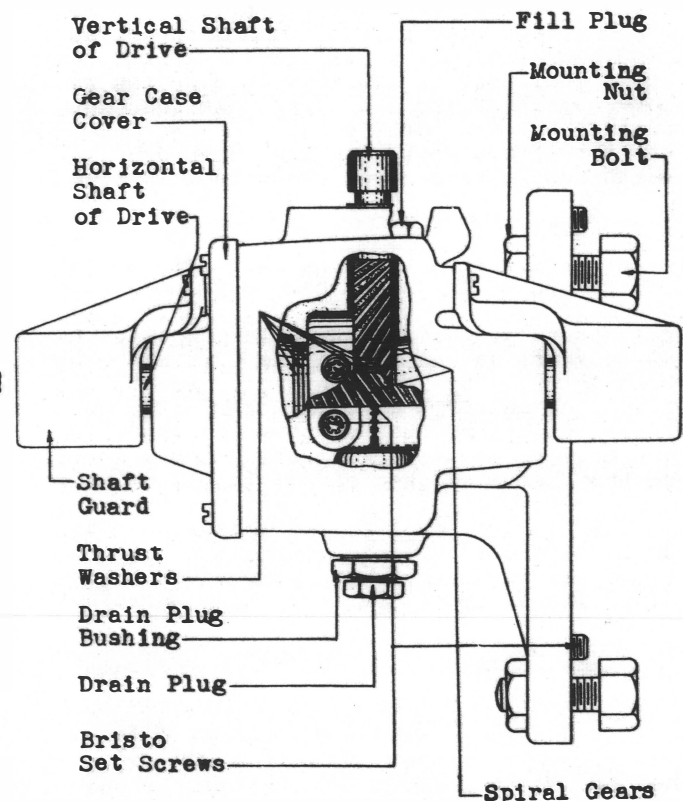


Fig. 45 - 32 Type Drives

Spiral Gear Mounted on Vertical Shaft on Drive, Thrust Washers and Vertical Shaft of Drive

3.98 Spiral Gear Mounted on Vertical Shaft of Drive: To replace the spiral gear that is mounted on the vertical shaft of the drive, remove the drive from the frame and the gear case cover from the gear case as outlined in 3.92 and 3.94, respectively. Remove the Bristo set screws with the No. 296 wrench. Slide the shaft up through the gear case until the shaft clears the gear. Remove the gear from the gear case and substitute the new part. To relocate the shaft, place the lower half of an eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down through the parts until the coupling rests on the thrust washers. Slide the gear up to the position formerly occupied by the gear which was replaced. Insert and tighten the inner and outer Bristo set screws securely.

3.99 Thrust Washers: To replace a thrust washer, remove the spiral gear from the vertical shaft of the drive as outlined in 3.98 and remove the defective washer. Substitute the new part and place the gear on the shaft as outlined in 3.98.

3.100 Vertical Shaft of the Drive: To replace the vertical shaft of the drive, remove or loosen the Bristo set screws in the spiral gear as outlined in 3.98 and remove the shaft from the gear case and substitute the new part, sliding it down through the top of the gear case and relocate the parts that were removed as outlined in 3.98.

Gear Case

3.101 To replace the gear case, remove the gears, thrust washers and shafts from the gear case as outlined in 3.93 to 3.100 respectively. Remove the fill plug with the KS-6367 wrench and remove the drain plug bushing with the R-1255 wrench. Remove the oil sight assembly as outlined in 3.24. Note the positions of the Bristo set screws which are used to adjust the location of the drive on the frame and then remove them from the drive with the No. 295 wrench. Run them into the new gear case to the position noted on the defective part. Reassemble and realign the parts that were removed as outlined in the procedures for these parts.

33 Type Drives

3.102 Where it is necessary to remove the drive from the frame, proceed as follows: Remove the coupling between the drive and the vertical shaft as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Note the amount and direction of eccentricity between the vertical drive shaft and the vertical shaft of the drive in order to facilitate re-

mounting the drive. Remove the motor and motor coupling assembly as outlined in 3.13 and the shaft guard as outlined in 3.103. Hold the drive mounting nuts with the 11/16" wrench and remove the mounting bolts with the R-1770 wrench. Take care not to change the position of the Bristo set screws which are used to adjust the position of the drive when removing the drive from the bracket. After making the necessary replacement of parts and reassembling the drive, remount it on the frame and realign as outlined in the Division 159 section covering this apparatus and then reassemble the vertical shaft coupling as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Reconnect the associated horizontal shafts as outlined below.

3.103 Shaft Guard: To replace a shaft guard, remove the shaft guard mounting screws with the 4" regular screwdriver and slide the guard away from the drive onto the horizontal shaft. Drive out the taper pins at each end of the horizontal shaft with the hammer and the 5/32" pin punch, or loosen the Bristo set screw with the No. 295 wrench as required. Place a piece of wire around the shaft and fasten the wire to the frame, or place a wooden block under the shaft in order to support it and prevent strain on the other coupling, and then shift the coupling head back onto the shaft. Remove the block and pin from the end of the coupling. Remove the shaft guard to be replaced from the horizontal shaft. Substitute the new part and reassemble the coupling on the connecting shaft. Slide the shaft guard back into place, and insert and tighten the mounting screws securely.

3.104 Extension Shaft: To replace the extension shaft, remove the shaft guard over the extension as outlined in 3.103. Hold the vertical shaft of the drive to prevent the horizontal shaft of the drive from turning and remove the extension shaft. Substitute and tighten the new part securely. Remount the shaft guard as outlined in 3.103.

3.105 Gear Case Cover: To replace a gear case cover, uncouple the shaft coupling on the side on which the cover is located as outlined in 3.103. Remove the gear case cover mounting screws with the 4" regular screwdriver and remove the cover. Substitute the new part and insert and tighten the mounting screws securely. Place the horizontal shaft in position and realign it as outlined in 3.103.

Ball Bearing, Oil Ring, Spiral Gear and Woodruff Key Mounted on Horizontal Shaft of Drive and Horizontal Shaft of Drive

3.106 General: To replace a ball bearing, an oil ring, the spiral gear or shaft, remove the drive from the frame and the gear case cover from the gear case as outlined

in 3.102 and 3.105. After making the necessary replacement of parts, reassemble the parts that were removed as outlined in the procedures for these parts. Mount the drive on the frame as outlined in 3.102.

3.107 Ball Bearing: To replace the ball bearing nearer the extension shaft remove the horizontal shaft and its associated parts from the gear case. Hold the spiral gear and remove the extension shaft. Remove the ball bearing from the shaft. Substitute the new part and reassemble and tighten the extension shaft securely. To replace the ball bearing further away from the extension shaft, it will be necessary to remove all the parts mounted on the shaft as outlined in 3.108 and 3.109 before removing the bearing.

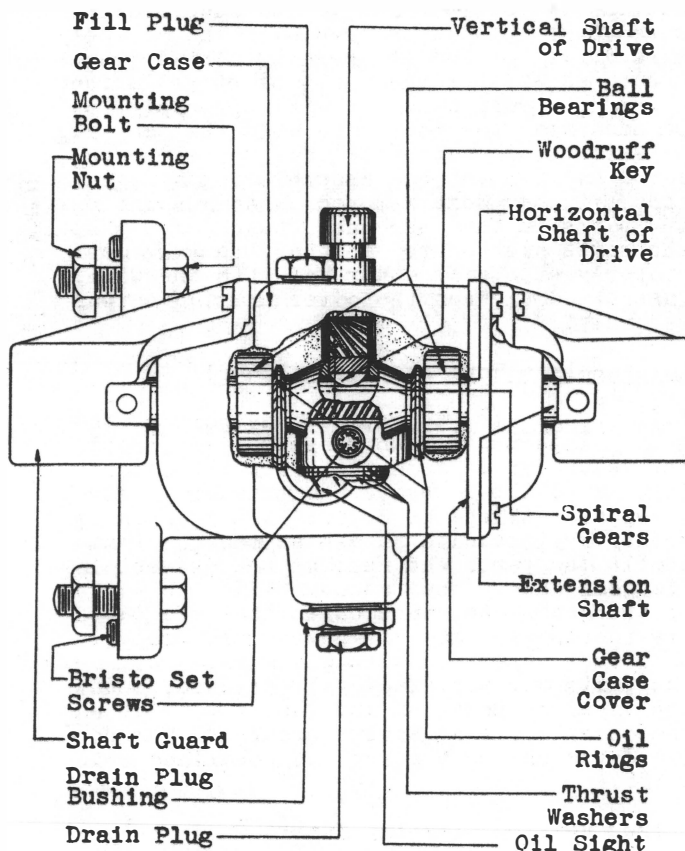


Fig. 46 - 33 Type Drive

3.108 Oil Ring: To replace the oil ring nearer the extension shaft, remove the ball bearing as outlined in 3.107 and remove the oil ring. Substitute the new part and reassemble the ball bearing and the

extension shaft as outlined in 3.107. To replace the oil ring further away from the extension shaft, remove the spiral gear as outlined in 3.109 before removing the oil ring.

3.109 Spiral Gear and Woodruff Key Mounted on Horizontal Shaft of Drive: To replace the spiral gear, remove the ball bearing and oil ring from the shaft as outlined in 3.107 and 3.108. Scribe a line on the shaft against one surface of the spiral gear with the No. 240 scriber so that the new gear may be correctly located. Slide the gear off the shaft. Substitute the new part and slide it on the shaft over the Woodruff key to the position formerly occupied by the gear that was removed. Reassemble the oil ring, ball bearing and extension shaft as outlined in 3.107 and 3.104. If the Woodruff key is to be replaced, remove the spiral gear as outlined above and then remove the key. Substitute the new part and reassemble as outlined in the above procedures.

3.110 Horizontal Shaft of Drive: To replace the horizontal shaft of the drive, remove the extension shaft, ball bearings, oil rings, spiral gear and Woodruff key as outlined in 3.104 to 3.109 inclusive. Insert the Woodruff key in the slot in the new shaft and reassemble the parts that were removed as outlined in 3.109.

Thrust Washers, Spiral Gear Mounted on Vertical Shaft of Drive and Vertical Shaft of Drive

3.111 Thrust Washers: To replace a thrust washer that is mounted on the vertical shaft of the drive, remove the drive from the bracket and remove the gear case cover as outlined in 3.102 and 3.105, respectively. Remove the outer Bristo set screws and loosen the inner Bristo set screws in the spiral gear with the No. 296 wrench. Slide the shaft up through the gear case until the shaft clears the washers. Remove the washer to be replaced from the gear case and substitute the new part under the end of the vertical shaft. To relocate the shaft, place the lower half of an eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down through the parts until the coupling rests on the thrust washers. Slide the spiral gear up to the position it formerly occupied. Insert and tighten the inner and outer Bristo set screws securely. Remount the gear case cover and remount the gear case on the bracket as outlined in 3.105 and 3.102, respectively.

3.112 Spiral Gear Mounted on Vertical Shaft of Drive: To replace the spiral gear, remove the thrust washers as outlined in 3.111 and remove the spiral gear. Substitute the new part and replace the thrust washers. Align the spiral gear as outlined in 3.111.

3.113 Vertical Shaft of the Drive: To replace the vertical shaft of the drive, remove the parts as outlined in 3.111. Remove the shaft from the gear case and substitute the new part, sliding it down through the top of the gear case as outlined in 3.111. Relocate the parts as outlined in 3.112.

Gear Case

3.114 To replace the gear case, remove the gears, thrust washers and shafts from the gear case as outlined in 3.102 to 3.113, inclusive. Remove the fill plug with the KS-6367 wrench and remove the drain plug bushing with the R-1255 wrench. Remove the oil sight assembly as outlined in 3.24. Note the positions of the Bristo set screws which are used to adjust the location of the drive on the frame and remove them from the drive with the No. 295 wrench. Run them into the new gear case to the positions noted on the defective part. Reassemble and realign the parts that were removed as outlined in the procedures for these parts.

34 and 1034 Type Drives

3.115 Where it is necessary, to remove the drive from the bracket, proceed as follows: Remove the coupling between the drive and the vertical drive shaft as outlined in the Division 159 section covering vertical drive shafts and associated apparatus. Note the amount and direction of eccentricity between the vertical drive shaft and the vertical shaft of the drive in order to facilitate remounting the drive. Remove the motor and motor coupling assembly as outlined in 3.13 and the shaft guard as outlined in 3.116. Hold the drive mounting nuts with the R-1317 wrench and remove the mounting bolts with the No. 246 or R-1770 wrench. Take care not to break the motor stop alarm wires. If necessary, disconnect the wires. After making the necessary replacement of parts and reassembling the drive, remount it on the bracket and realign as outlined in the Division 159 section covering this apparatus and then reassemble the coupling between the drive and the vertical drive shaft as outlined in the Division 159 section covering vertical drive shafts and associated apparatus.

3.116 Shaft Guard: To replace a shaft guard, remove the shaft guard mounting screws with the 4" regular screwdriver. If a connecting shaft is connected to the drive, slide the shaft guard onto the horizontal shaft or if a connecting shaft is not used remove the guard. Drive out the taper pins in each horizontal shaft with the hammer and the 5/32" pin punch or loosen the Bristo set screw with the No. 295 wrench as required. Place a piece of wire around the shaft and fasten the wire to the frame, or place a wooden block under the shaft in order to support it and prevent strain on the other

coupling, and then shift the coupling head back onto the shaft. Remove the block and pin from the end of the coupling. Remove the shaft guard to be replaced from the horizontal shaft. Substitute the new part, reassemble the coupling on the connecting shaft. Slide the shaft guard back into place, and insert and tighten the mounting screws securely.

3.117 Gear Case Cover: To replace the gear case cover, remove the motor coupling assembly as outlined in 3.13 and remove the gear case cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. Remove the cover and substitute a new one. Insert and tighten the mounting screws securely and remount the motor coupling assembly.

3.118 Intermediate Worm Cover: To replace an intermediate worm cover, remove the drive from the bracket, if necessary, as outlined in 3.115. Remove the intermediate worm cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. Due to the fit of the ball bearing in the cover, the worm assembly will probably be removed from the gear case with the cover. Substitute the new parts and reassemble the parts and remount the assembly in the gear case, if they were removed. When remounting the parts in the gear case, take care that the parts are located so that the gears mesh properly with each other and with the worm. Insert and tighten the cover mounting screws securely.

Intermediate Worm Assembly (Lower)

3.119 General: To replace any part of the intermediate worm assembly (lower), remove the drive from the bracket as outlined in 3.115. Remove the intermediate worm cover as outlined in 3.118. After the necessary replacements have been made, reassemble the parts and remount the assembly in the gear case. When reassembling the parts of the gear case, take care that the parts are located so that the gears mesh properly with each other and with the worm. After the parts are satisfactorily aligned, mount the cover in position and insert and tighten the cover mounting screws securely. Remount the drive on the bracket as outlined in 3.115.

3.120 Bearing Clamping Nuts: To replace a bearing clamping nut, remove the bearing clamping nut lock screw with the 3" cabinet screwdriver and remove the nut. Substitute the new part on the shaft tightening it securely in place. Then insert and tighten the lock screw.

3.121 Ball Bearing: To replace a ball bearing, remove the associated bearing clamping nut as outlined in 3.120 and remove the bearing. Substitute the new part and mount the clamping nut on the shaft as outlined in 3.120.

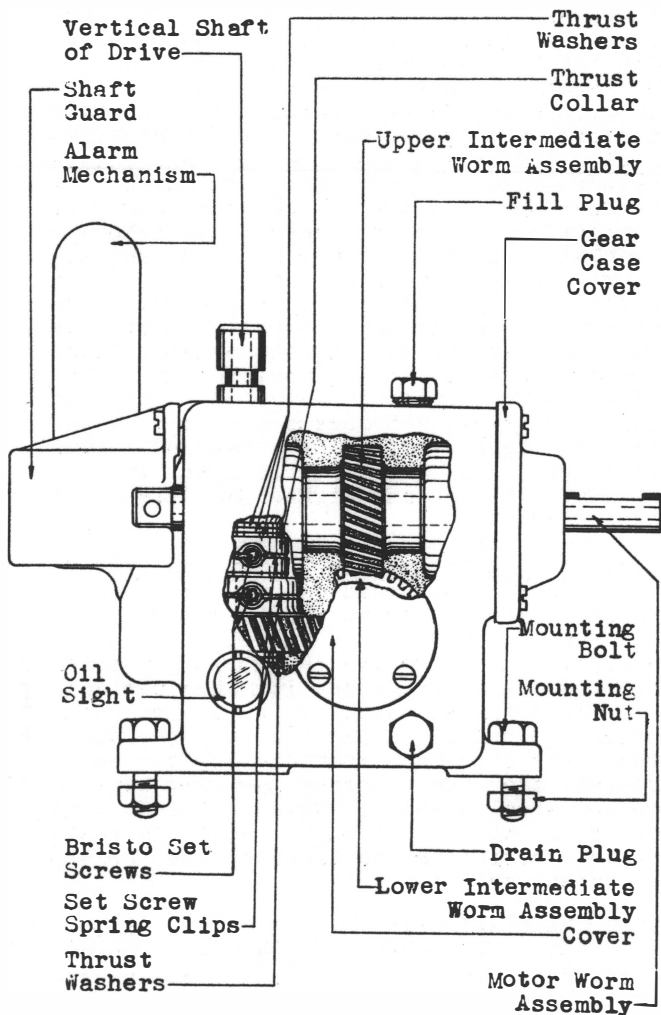


Fig. 47 - 34 and 1034 Type Drives

3.122 Worm Wheel and Woodruff Key: To replace the worm wheel or Woodruff key, remove the bearing clamping nut and the ball bearing from the end of the shaft nearest the worm as outlined in 3.120. Remove the outer and loosen the inner Bristo set screws with the No. 296 wrench. Slide the worm wheel off the shaft. If the worm wheel is to be replaced, remove the inner Bristo set screw and insert it loosely in the new wheel and substitute the new part on the shaft in the position formerly occupied by the wheel that was removed. If the Woodruff key is to be replaced, remove it from the shaft and substitute a new one. Remount the wheel as outlined above. Tighten the inner Bristo set screws and insert and tighten the outer Bristo set screws securely. Remount the bearing and clamping nut that were removed as outlined in 3.120 and 3.121.

3.123 Spiral Gear and Woodruff Key: To replace a spiral gear or Woodruff key remove the bearing clamping nut and ball bearing from the end of the shaft nearest the spiral gear as outlined in 3.120 and 3.121. Remove the set screw spring clip with the long nose pliers and loosen the Bristo set screw with the No. 296 wrench. Slide the gear off the shaft. If the spiral gear is to be replaced, remove the Bristo set screw and insert it loosely in the new part and substitute the gear on the shaft. If the Woodruff key is to be replaced, remove it from the shaft and substitute a new one. Replace the gear as outlined above. Place it in the position formerly occupied by the gear that was removed. Tighten the Bristo set screw securely and insert the set screw spring clip. Remount the other parts that were removed as outlined in 3.120 and 3.121.

3.124 Worm: To replace the worm, remove the ball bearing, worm wheel, spiral gear and Woodruff keys as outlined in the procedures covered above and place them on the new worm. Before removing the worm wheel or spiral gear, note their positions on the shaft and attempt to locate the parts on the new shaft in corresponding positions. After aligning the parts, insert and tighten the Bristo set screws securely.

Motor Worm Assembly

3.125 General: To replace any part of the motor worm assembly, remove the intermediate worm assembly (lower) from the gear case as outlined in 3.119. Remove the cover through which the motor worm shaft projects and remove the motor worm assembly from the gear case. Remove the alarm governor from the shaft as outlined in 3.16 if it is on the end of the shaft on which the replacement is to be made. After the necessary replacements have been made, mount the alarm governor on the shaft as outlined in 3.16. After remounting the motor worm assembly in the gear case, mount the intermediate worm assembly as outlined in 3.119 and remount and secure the cover that was removed.

3.126 Bearing Clamping Nut: To replace a bearing clamping nut, remove the bearing clamping nut lock screw with the 3" cabinet screwdriver and remove the nut. Substitute the new part on the shaft, tightening it securely in place. Then insert and tighten the lock screw.

3.127 Bearing: To replace a ball bearing, remove the associated bearing clamping nut as outlined in 3.126 and remove the bearing. Substitute the new part and remount the bearing clamping nut as outlined in 3.126.

3.128 Worm: To replace a worm, remove the bearing clamping nuts and ball bearings from the end of the shaft as outlined in 3.126 and 3.127 and mount them in position on the new worm. Remount the assembly in the gear case as outlined in 3.126.

Intermediate Worm Assembly (Upper) (No. 34A and No. 1034A Drives Only)

3.129 General: In order to replace any part of the intermediate worm assembly (upper), remove the lower intermediate worm assembly as outlined in 3.119 to 3.124, inclusive and remove the gear case cover through which the motor worm shaft projects, as outlined in 3.117. Remove the upper intermediate worm assembly from the gear case.

3.130 Bearing Clamping Nut: To replace the bearing clamping nut, remove the bearing clamping nut lock screw with the 3" cabinet screwdriver and remove the nut. Substitute the new part on the shaft, tightening it securely in place. Then insert and tighten the lock screw.

3.131 Ball Bearing: To replace the ball bearing nearest the bearing clamping nut, remove the clamping nut as outlined in 3.130 and remove the ball bearing. Substitute the new part and mount the clamping nut as outlined in 3.130.

3.132 Spiral Gear and Woodruff Key: To replace the spiral gear or Woodruff key, remove the ball bearing as outlined in 3.131 and slide the gear off the shaft. If the Woodruff key is defective, replace it at this time. Substitute a new gear if necessary and slide it over the Woodruff key. Reassemble the parts that were removed as outlined in 3.129 to 3.131 inclusive.

3.133 Ball Bearing: To remove the ball bearing that is on the opposite side of the spiral gear from the clamping nut, remove the spiral gear as outlined in 3.132 and remove the ball bearing. Substitute the new part and reassemble the parts that were removed as outlined in 3.132.

3.134 Intermediate Shaft: To replace the intermediate shaft, remove the bearing clamping nuts, ball bearings, spiral gear and Woodruff key as outlined in 3.129 to 3.133 inclusive. Place these parts on the new shaft and align them as outlined in 3.129 to 3.133 inclusive.

Worm Wheel Mounted on Vertical Shaft, Thrust Collar and Thrust Washers and Vertical Shaft of the Drive

3.135 General: In order to replace the vertical shaft of the drive or any part mounted on it, remove the intermediate (lower and upper) worm assemblies from the gear cases outlined in 3.119 to 3.134 inclusive. Remove the covers as necessary in order to facilitate the replacement of parts. After making the necessary replacement of parts, reassemble the intermediate (lower and upper) worm assemblies as outlined in the procedures noted above, and remount and secure the covers that were removed.

3.136 Worm Wheel: To replace the worm wheel, remove the set screw spring clips on the worm wheel and thrust collar with the long nose pliers. Remove the outer and inner Bristo set screws in the worm wheel with the No. 296 wrench and place the inner screws in the new worm wheel. Loosen the Bristo set screw in the thrust collar with the No. 296 wrench. Slide the vertical shaft upward until the lower end clears the worm wheel. Remove the worm wheel from the gear case and substitute the new part in position in the gear case. To relocate the shaft, place the lower half of an eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down through the parts until the coupling rests on the thrust washers. Slide the worm wheel up to the position which the defective part formerly occupied and tighten the inner Bristo set screws securely. Insert and tighten the outer Bristo set screws securely. Place the thrust collar in its original position and tighten the Bristo set screw securely.

3.137 Thrust Collar and Thrust Washers: To replace a thrust collar or a thrust washer, remove the worm wheel as outlined in 3.136 and remove the thrust collar from the vertical shaft. Remove the Bristo set screw from the collar and place it in the new collar. If a thrust washer is to be replaced, remove the thrust collar and then the washers. Take care when reassembling the washers that the bronze washer is placed between the two steel washers. Remount the thrust collar and worm wheel on the shaft in their original positions and tighten the Bristo set screws securely.

3.138 Vertical Shaft of the Drive: To replace the vertical shaft of the drive, remove the worm wheel, thrust collar and thrust washers as outlined in 3.136 and 3.137. Remove the vertical shaft from the gear case and substitute the new part, sliding it down through the top of the gear case as outlined above. Relocate the parts that were removed as outlined in the procedures noted above.

Dummy Shaft and Associated Parts (Nos. 34B and No. 1034B Drives Only)

3.139 General: On Nos. 34B and 1034B drives only, the upper intermediate worm assembly is not specified. Instead a machine screw is used as a dummy shaft to fill the hole of the casting.

3.140 Dummy Shaft and Associated Parts: To replace the dummy shaft or any associated part, remove the cover through which the motor shaft projects as outlined in 3.125 to 3.128 inclusive. Hold the mounting nut with the KS-6367 wrench and remove the screw from the gear case with the 4" regular screwdriver. Make the necessary replacement of parts and remount the screw in the gear case.

In remounting the screw in the gear case, take care that one large washer is placed on the screw against the under surface of the screw head and that after the screw is in place in the gear case, a large washer and a small washer, in the order named, are placed on the screw. Then remount and tighten the mounting nut securely. Remount the cover that was removed as outlined in 3.125 to 3.128 inclusive.

3.141 Gear Case: To replace the gear case, remove the intermediate worm assemblies, motor worm assembly and the vertical shaft of the drive as outlined in 3.119 to 3.136 inclusive. On Nos. 34B and 1034B drives, remove the dummy shaft and associated washers as outlined in 3.139 and 3.140. Remove the fill and drain plugs, the alarm mechanism and oil sight assembly as outlined in procedures covering these parts. Assemble all parts in the new gear case as outlined in the procedures covering these parts.

Shafts

2 Type Shafts and Associated Parts

3.142 General: To replace a 2 type shaft or associated part, remove the shaft guard as outlined in the procedure covering the type of drive with which the shaft guard is associated. Loosen the Bristo set screw in the coupling head with the No. 295 wrench or drive out the taper pin as required with the hammer and 5/32" pin punch. After making the necessary replacement of parts, remount the parts that were removed.

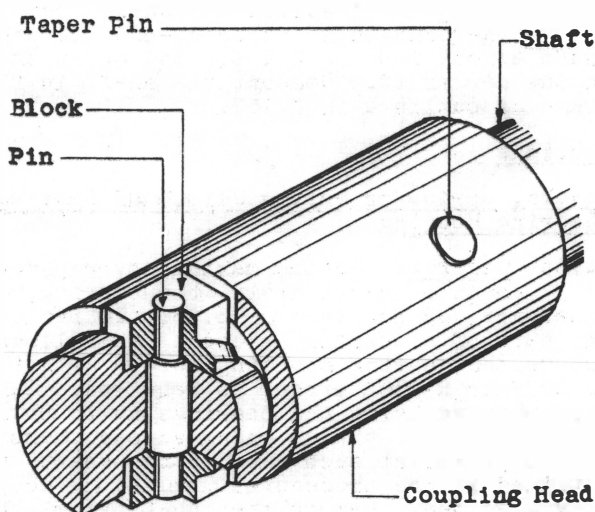


Fig. 48 - Nos. 2A and B Shaft

3.143 Block and Pin: To replace the block, slide the coupling head back on the shaft, remove the pin and remove the block. Substitute the new part and reinsert the pin. Slide the coupling head back into place and reassemble as outlined in 3.142.

3.144 Coupling Head: To replace a coupling head, proceed as outlined in 3.142 and 3.143, except that the blocks and pins are removed from both ends of the shaft. After removing these parts, slide the coupling head to be replaced off the shaft. Substitute the new part and relocate the blocks and pins unless the entire coupling is being replaced in which case locate the new parts. Slide the coupling heads into place and reassemble as outlined in 3.142.

3.145 Shaft: To replace a shaft, remove the blocks and pins as outlined in 3.144. Remove the coupling heads from both ends of the shaft and place them on the new shaft. Mount the new shaft in the frame and reassemble.

No. 3A and 6 Type Shafts

3.146 General: To replace any part of the No. 3A or 6 type shaft, remove the coupling guard as outlined in the procedure covering the type of drive to which the shaft is connected.

3.147 Coupling Head Assembly and Leather Washer: To replace either a coupling head or leather washer, loosen the Bristo set screw in the coupling heads at each end of the shaft with the No. 295 wrench and slide the coupling heads back onto the shafts. Remove the shaft from the frame. Remove the part to be replaced and substitute the new part. Remount the shaft in the frame and slide the coupling heads along the shafts to their proper position taking care that each

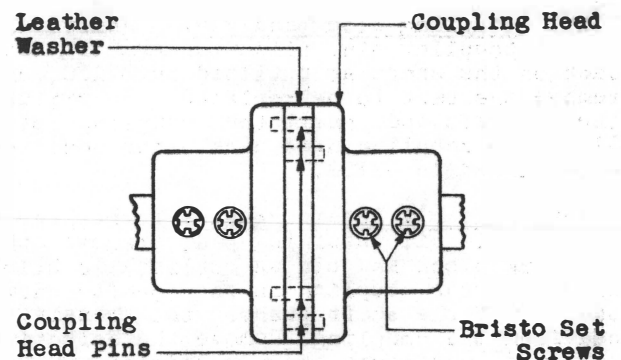


Fig. 49 - No. 3A and 6 Type Shafts

half is in satisfactory engagement with its associated half. Tighten the Bristo set screws securely. To replace the leather washer, loosen one coupling head and slide it back along the shaft enough to permit the removal of the washer. Substitute the new part and reassemble as outlined above.

3.148 Coupling Head Pins: If the coupling pins are badly worn and the coupling casting is in good condition, replace the coupling pins, drive out the old pins with the 5/32" pin punch and the hammer. Insert the new pins in the holes and force them into position in the coupling head. In order to force the pins in straight without danger of damaging the pins or the coupling head, place the head in a vise and hold the pin in front of a hole in the head so that when the vise is closed the pin will be pressed into position. Close the vise slowly taking care that the pin is at right angles to the face of the coupling head. Force the pin in the head until the end that is in the hole is slightly underflush with the surface opposite the coupling face. Repeat this operation with each pin that is to be replaced.

3.149 Shaft: To replace a shaft, remove the coupling heads as outlined in 3.147 and place them on the new shaft. Reassemble and secure the shaft in the frame as outlined, procedure noted above.

No. 10A Shafts and Associated Parts

3.150 General: To replace a No. 10A shaft or associated part, remove the shaft guard as outlined in the Division 159 section covering friction roll drives. Loosen the Bristo set screws which secure the couplings to the shaft with the No. 295 wrench and slide the couplings on the shaft away from the drive. After making the necessary replacement of parts, slide the couplings into place and tighten the Bristo set screws securely.

3.151 Coupling Block and Pin: Remove the coupling pin, slide the coupling head back on the shaft as outlined in 3.150, and remove the part to be replaced. Substitute the new part and insert the coupling pin. Slide the coupling head back into position as outlined in 3.150.

3.152 Felt Oil Retaining Pad: To replace a felt oil retaining pad, remove the coupling block and pin as outlined in 3.151 and slide the coupling on the shaft until the end of the shaft pushes the retaining pad from the coupling. Remove the defective part and substitute a new retaining pad. Reassemble the parts as outlined in 3.151.

3.153 Coupling: To replace the coupling, loosen the Bristo set screws at both ends of the shaft and slide the couplings toward the center of the shaft until they clear the coupling block. Remove the shaft

from the frame. Remove the coupling that is to be replaced and remove the retaining pad, Bristo set screws and the coupling head from it. Mount these parts in place on the new coupling and substitute it on the shaft. Remount the shaft in the frame and reassemble as outlined in 3.151, taking care that the flat portion of the shaft is under the Bristo set screw before tightening the screw.

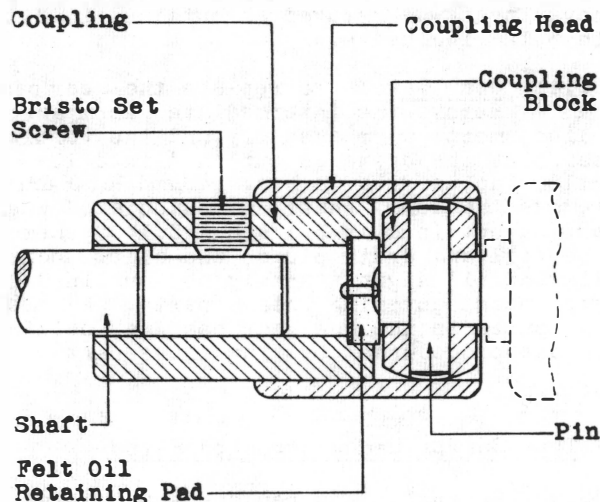


Fig. 50 - No. 10A Shaft

3.154 Coupling Head: To replace the coupling head, remove the coupling from the shaft as outlined in 3.153. Remove the coupling head and substitute the new part. Reassemble the coupling as outlined in 3.153.

3.155 Shaft: To replace the shaft, remove the couplings at both ends of the shaft as outlined in 3.153, and mount them on the new shaft. Remount the shaft in the frame as outlined in 3.153.

Bearings

Covers, Spring or Spring Clip, Ball Bearing, Bearing Housing

3.156 General: Before making any replacement of parts drain the bearing, if necessary, as outlined in 3.03. To replace any part of a bearing, proceed as follows. Remove the bearing mounting screws with the KS-8097 or R-2382 wrench as required. Take care when removing the bearings not to change the position of the aligning screws. Remove the couplings at each end of the shaft as outlined in the procedures covering the coupling involved. Remove the shaft from the frame and remove the bearing from the shaft. After making the necessary replacement of parts, slide the bearing on the shaft and remount the shaft in the frame as outlined in the procedure noted above. Then, mount the bearing securely in position on the frame.

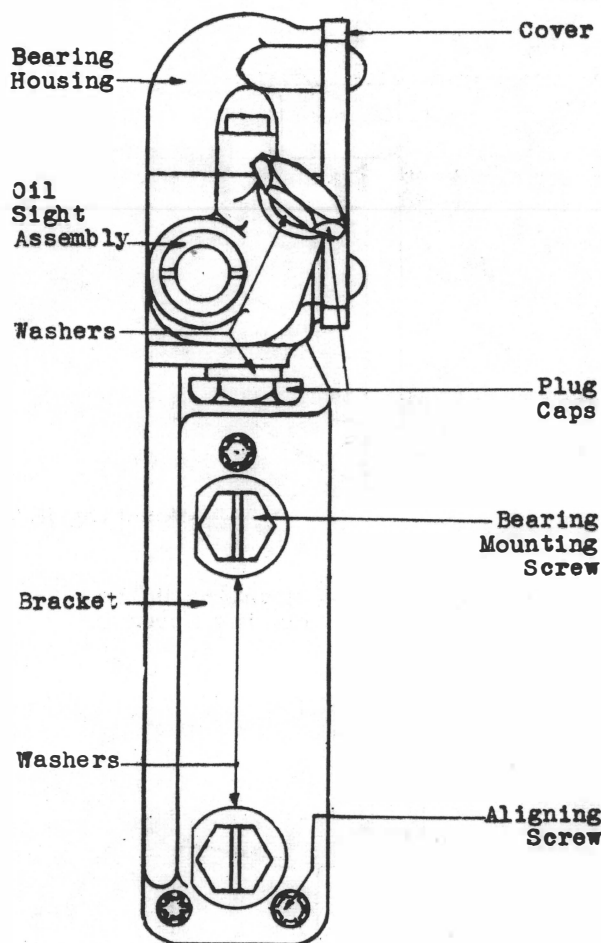


Fig. 51 - Bearing and Associated Parts

3.157 Cover: To replace the cover, remove the cover mounting screws with the 4" regular screwdriver, substitute the new part and insert and tighten the mounting screws securely.

3.158 Spring: To replace the spring on Nos. 5A, 6A and 8A bearings, remove the cover as outlined in 3.157 and remove the bearing from the housing. Remove the spring with the long-nose pliers and substitute the new part. Remount the ball bearing in the bearing and remount the cover as outlined in 3.157. The spring clip is not replaceable on Nos. 5B, C, 6B, 8B, 9A or 12A bearings but must be replaced as part of the ball bearing.

3.159 Ball Bearing: To replace the ball bearing, remove it as outlined in 3.158 and remove the spring if it is replaceable. Assemble the spring in the new ball bearing and remount it in the housing as outlined in 3.158.

3.160 Bearing Housing and Bracket: If a housing or bracket is to be replaced, replace both the housing and bracket as an

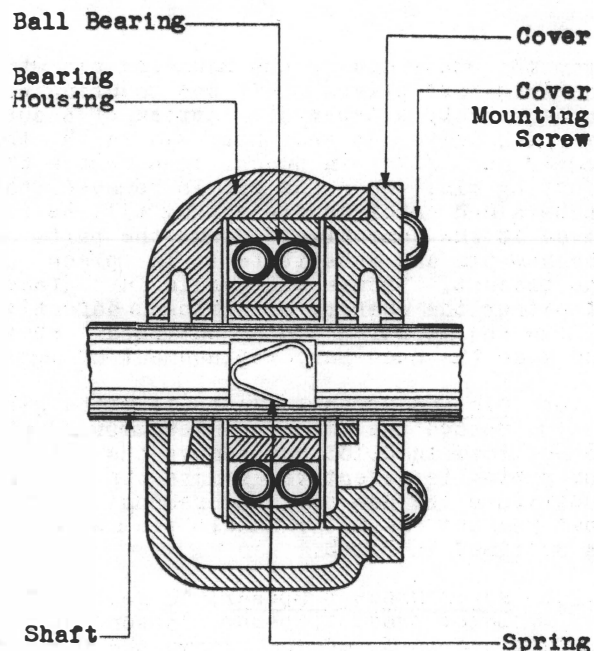


Fig. 52 - Internal Parts of Bearings Equipped with Removable Spring

assembly. Remove the ball bearing and associated parts as outlined in 3.158. Mount these parts in the new housing and mount the cover securely in place on the new bracket. Remove the mounting screws with the 4" regular screwdriver and remove the aligning screws with the No. 295 wrench. Before removing the aligning screws, note the position of the screws so that they may be run into the new bracket to the depth they occupied in the defective part. Place the bearing bracket in position on the frame as outlined in 3.156. Mount the new housing in place on the bracket and insert and tighten the mounting screws securely.

Motor Brackets

3.161 General: To make any replacement of parts mounted on a bracket, remove the motor from the bracket as outlined in 3.13. It is recommended that brackets that are pinned should be replaced by the Western Electric Company.

3.162 Motor Handle: To replace the motor handle, remove the cotter pins in the bearing pin with the long-nose pliers. This type of cotter pin may be pulled out of and inserted in its position without bending the pin. Remove the bearing pin and the handle. Substitute the new part and insert the pin in place. Then insert the cotter pins.

3.163 Motor Handle Mounting Pin, Washers and Spring: To replace the motor handle mounting pin, remove the motor handle as outlined in 3.162. Remove the cotter pins

from the other end of the mounting pin with the long-nose pliers. If the mounting pin is secured by a taper pin instead of a cotter pin, drive out the taper pin with the hammer and 5/32" pin punch. Then remove the mounting pin. When the pin is removed, the washers and motor handle spring will be removed at the same time. Mount the parts on the new pin and substitute it in place on the bracket. Secure the handle in place. If either the washers or spring is defective, remove the mounting pin as outlined above and make the necessary replacement of parts.

3.164 Gib and Spring: To replace the gib, remove the motor bracket mounting pin as outlined in 3.163 and remove the gib. If the spring is defective, remove the spring. Substitute the new part and remount the gib. Then remount the motor handle pin and handle as outlined in 3.163.

3.165 Motor Bracket Spacer: To replace the motor bracket spacer, loosen the gib as outlined in 3.164 and remove the spacer from the bracket. Substitute the new part and secure the gib in place.

3.166 Aligning Screws and Lock Nuts: To replace an aligning screw, note the setting of the screw and proceed as follows. If a Bristo set screw is to be replaced, remove it with the No. 296 wrench and substitute the new part in the frame or on the bracket to the depth to which the replaced part was previously adjusted. On No. 12A brackets, remove the drive as outlined in the procedure covering the drive with which the bracket is associated and proceed as follows. If the headless set screw is to be replaced, remove it with the 3" cabinet

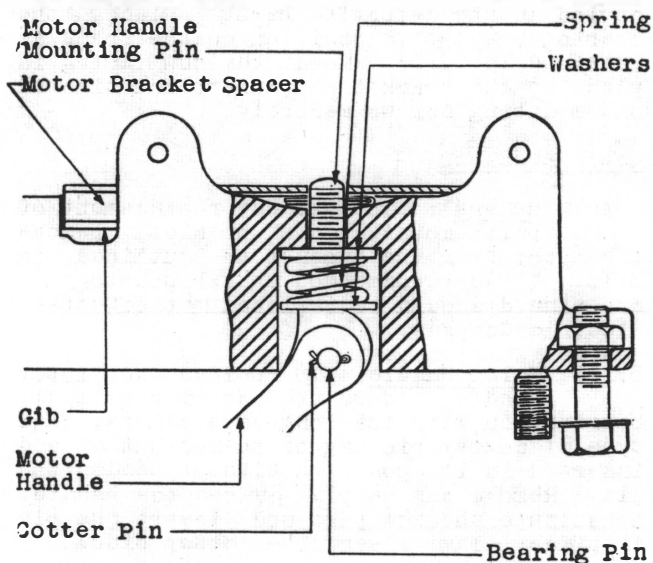


Fig. 53 - Motor Handle and Associated Parts

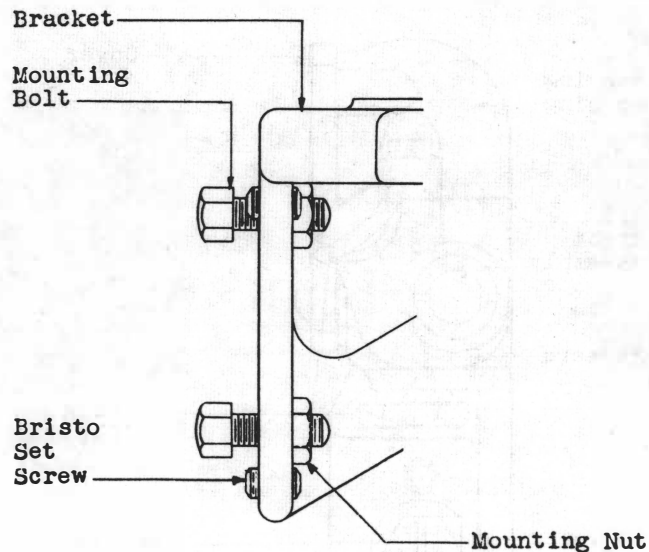


Fig. 54 - Bracket Mounting Bolts and Adjusting Screws

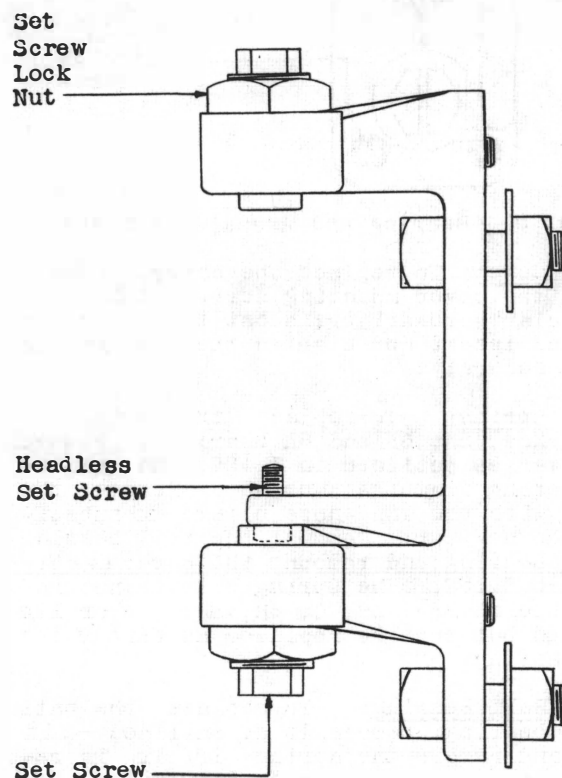


Fig. 55 - Adjusting Screws on No. 12A Bracket

screwdriver. Insert and adjust the new part in the bracket to the depth previously noted. To replace a set screw, loosen the set screw lock nut with the No. 232 wrench and remove the set screw with the R-2382 wrench. Substitute the new part and run it in to the depth previously noted before tightening the lock nut securely.

3.167 Brackets: To replace a bracket, remove the drive from the bracket as outlined in the procedure covering the type of drive involved. Hold the mounting nut

with the No. 246 or R-1770 wrench and remove the mounting bolts with the No. 246 or R-1317 wrench. Remove the bracket from the frame. Remove the motor handle and associated parts as outlined in 3.161 to 3.166 inclusive and mount them on the new bracket. Note the positions of the set screws and adjusting screws and remove them from the bracket as outlined above and mount them on the new bracket as outlined above. Mount and secure the new bracket in place on the frame and remount and realign the parts that were removed.

